JANUARY, 1956

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

IN THIS ISSUE

Editorial: "Atoms Are Not Everything"

•

Talk of the Month: "Building Heated Plastic Molds"

•

MACHINING Work-Hardened Alloy Steels

•

MEASURING to Millionths with Chrome Carbide

•

HOW TO AUTOMATE Your Plant

•

Precision Measurement of CYLINDRICAL BORES

•

A New Concept in PRESS AUTOMATION

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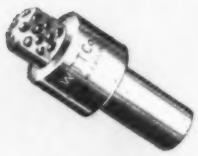

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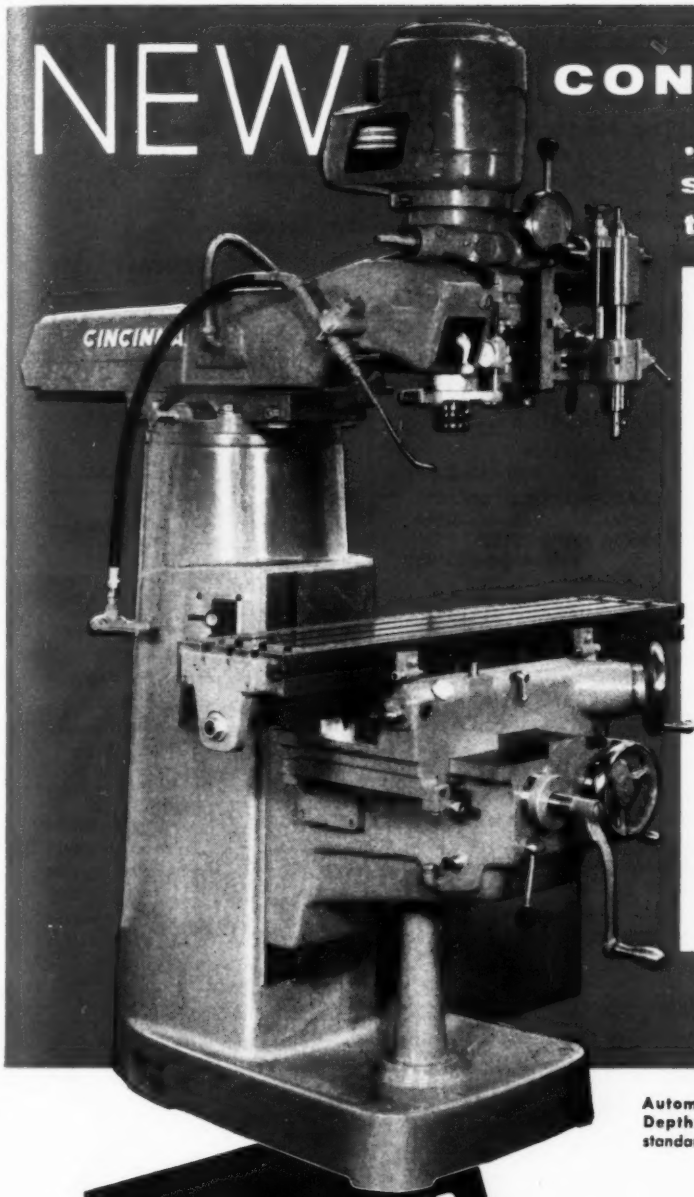

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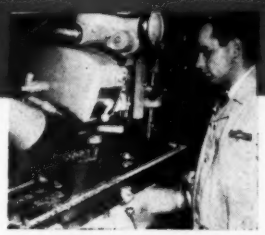

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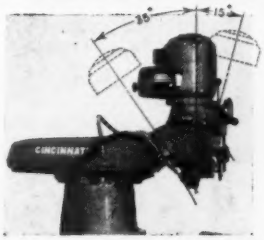

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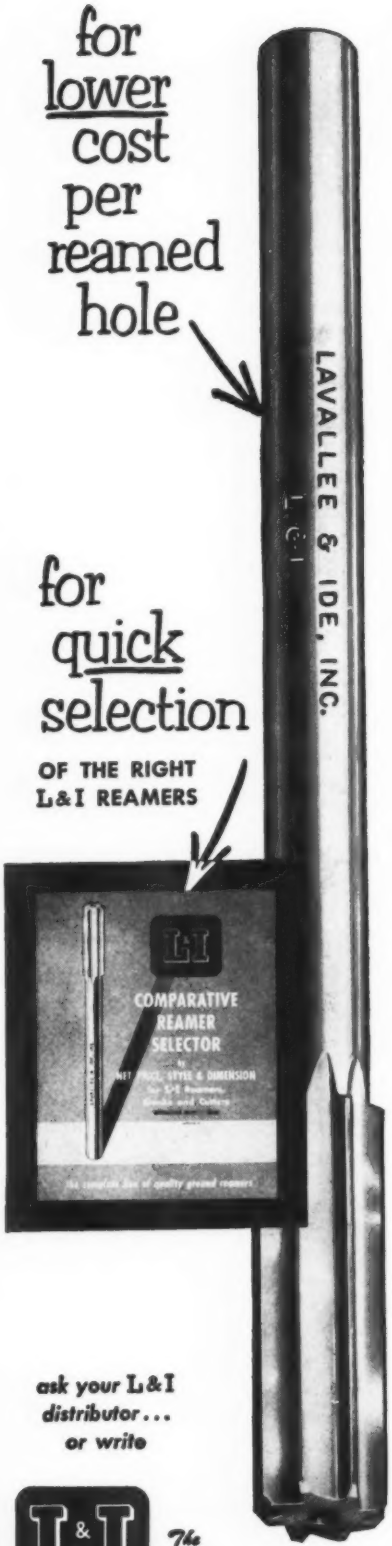

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The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
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George J. Huebner, Founder

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Editorial 61
Complete Index 62

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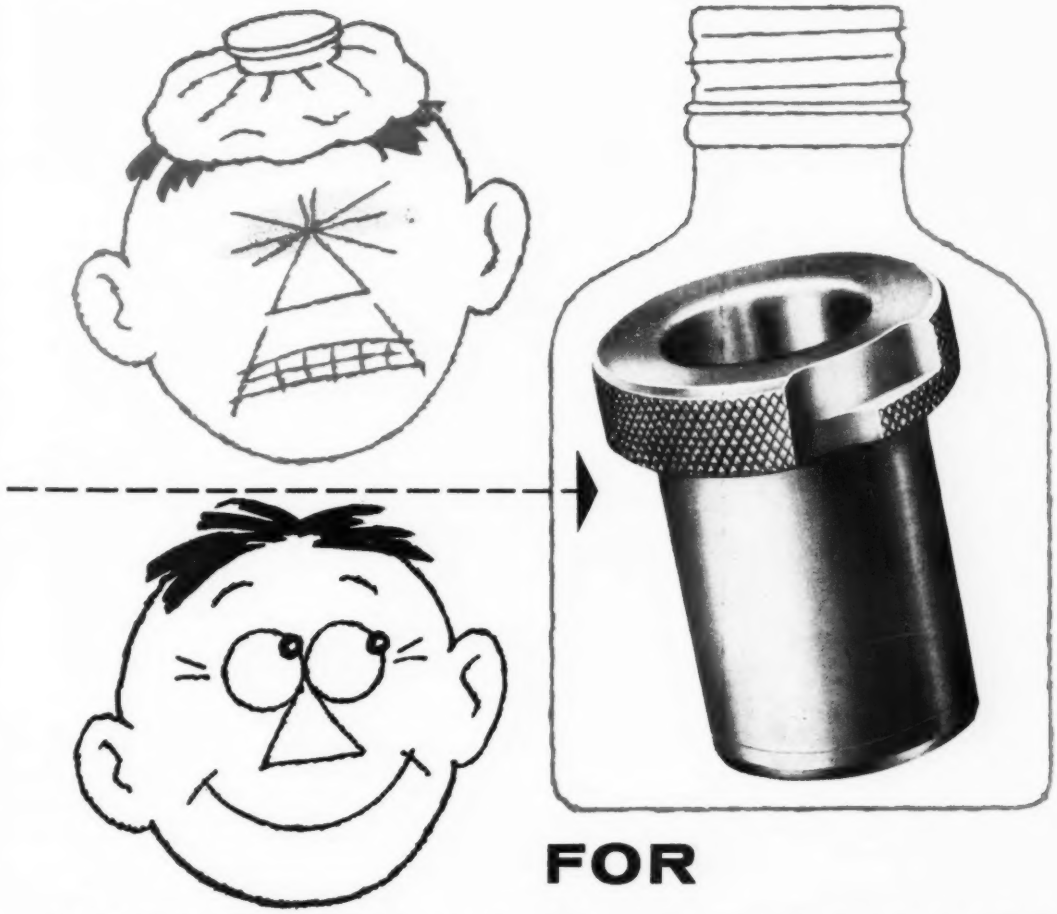

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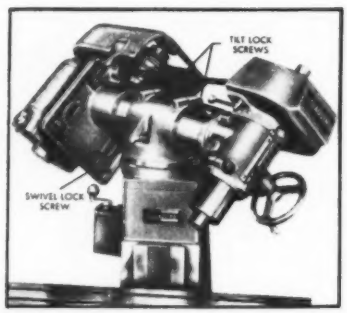
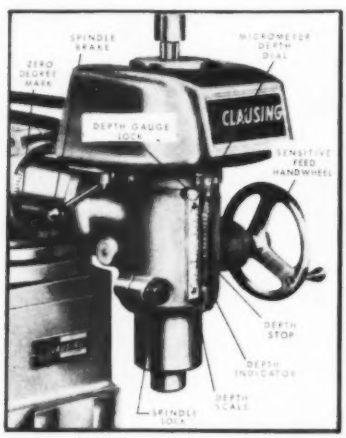


The Heart of the CLAUSING MILL is its rigid, high precision spindle head. It has 7 ball bearings—spindle is chrome nickel steel, hardened and ground — quill, ground and hard chrome plated, has full-length honed bearing seat—overarm is an electric furnace casting, with ¾" thick walls, precision ground.



The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream and shape at all angles with one set-up. Quill has micrometer depth control stop and two feeds, lever and hand wheel.

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2. Table top, front to back, square with column ways 0 to .001".
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5. Spindle taper (internal) run out within .0002" at spindle nose.
6. Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

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Size of Table	6" x 24"
Longitudinal Table Travel	15"
Transverse Table Travel	5"
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Maximum Distance Spindle to Column	8¾"
Quill Travel	3"

Spindle Speeds: Six, 180 to 3250 R.P.M. — No. 7 Brown and Sharpe or No. 2 Morse Taper Spindle, Optional — Operates from ½ or ¾ HP, 1725 R.P.M. Motor.

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SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

Compare UNBRAKO-recommended tightening torques with those of ordinary socket set screws and you readily see why you can set an UNBRAKO and then forget it. The reasons are simple. UNBRAKOS have deeper sockets, which give you better purchase with the wrench; rounded socket corners, which eliminate the sharp corners where cracks start; fully formed threads, which make them stronger; and knurled cup points, which keep them tight.

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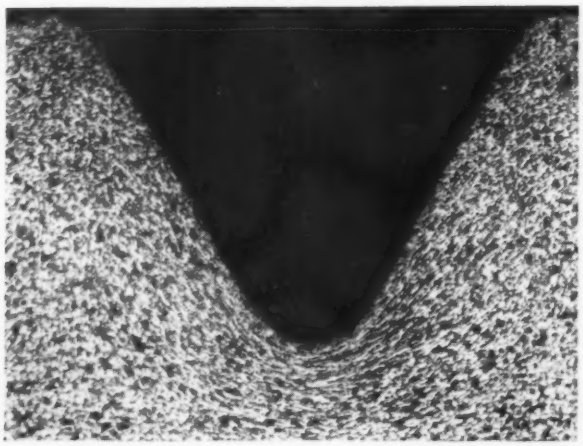
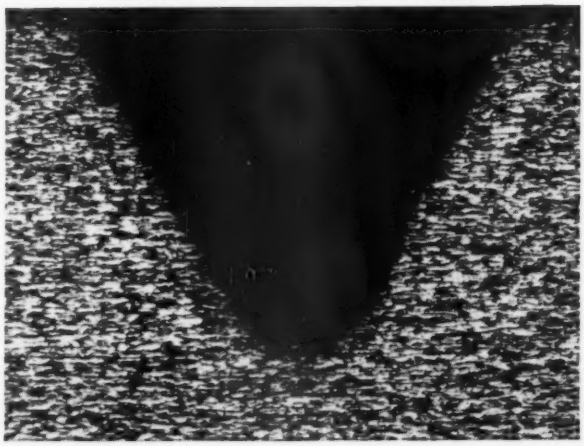
UNBRAKO SET SCREW THREADS



ORDINARY SET SCREW THREADS



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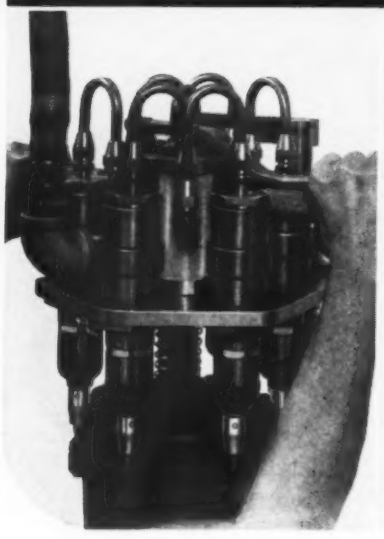

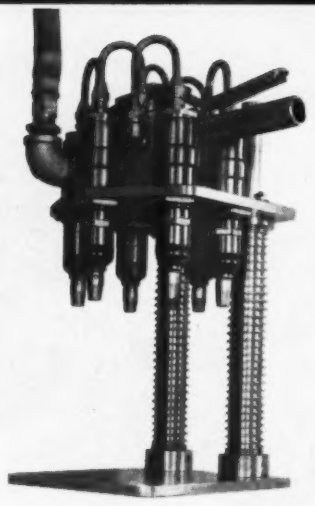

Now—an entire assembly operation, where two or more fasteners are used, can be completed in the same time required to drive a single fastener. The savings you can make will increase directly with the number of tools in your Buckeye multiple-unit tool. You decide how many screws or nuts you wish to drive—simultaneously . . . or how many holes you want to drill—simultaneously . . . you're limited only by the air supply available in your plant.

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Buckeye multiple-unit fastening and drilling tools are engineered to your specific requirements. They may be arranged on self-supporting arms, as illustrated, or designed for suspension above the work. Just send a letter or sketch, outlining your assembly operation, or ask to have a Buckeye Tools Sales Engineer visit you. Either way, it costs you nothing to learn how you can step up assembly output and cut assembly costs—simultaneously.

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producers of the world's first successful rotary air tools

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

BUILDING HEATED PLASTIC MOLDS

by Leo J. Costanza
Material and Process Engineer
DOUGLAS AIRCRAFT CO., INC.
El Segundo, Calif.

THERE HAS BEEN A GREAT DEAL of interest within the aircraft industry centered on the problem of obtaining molds at a comparatively lower cost for the fabrication of radomes and other reinforced polyester and epoxy parts as well as for contact forming acrylic canopies.

With the introduction of relatively high temperature epoxy resins, it was decided to investigate the possibility of using these aluminum filled epoxy resins with fiberglas cloth in the construction of molds for the fabrication of heat cured polyester-fiberglas parts. Consequently, several molds were built and hundreds of parts have been fabricated in over a year of active service for these molds.

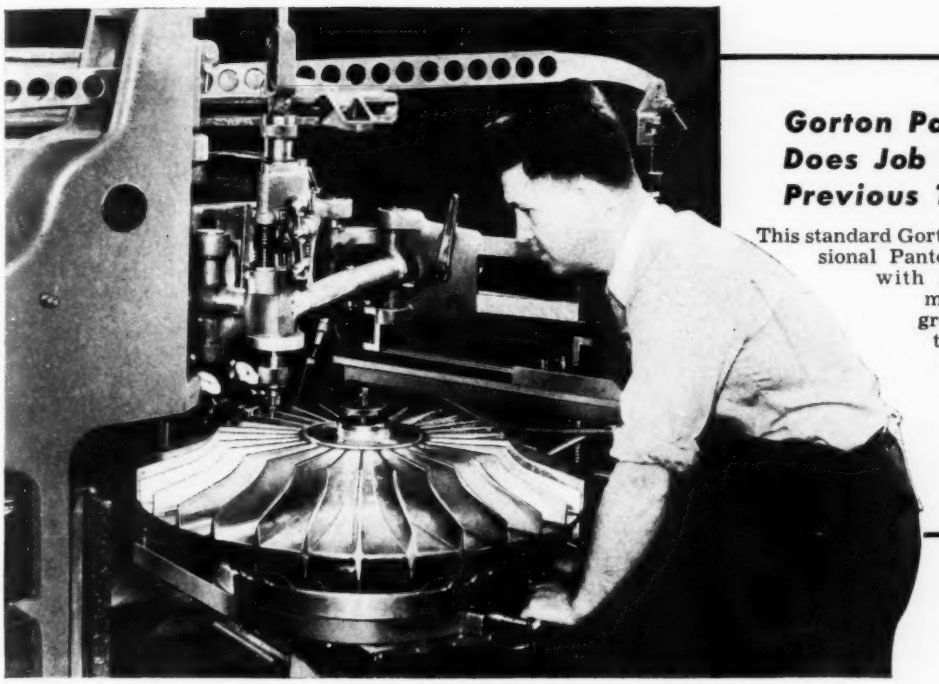
Several high temperature epoxy fiberglas molds were also constructed in the past year for contact forming acrylic canopy sections. Although still in development, a number of acrylic sections have been produced.

Tapes Imbedded For Curing

An investigation was also made on the use of silastic imbedded electric resistance tapes for heat-curing edge attachments and reactive cements in conjunction with acrylic canopies. It naturally evolved that there was a possibility that these tapes could be incorporated into molds as surface heaters with the assurance of better heat control, curtailment of oven facilities, and increased production of plastic parts.

Preliminary work was conducted with the construction of 5/8" thick flat plates using the tapes imbedded in high temperature epoxy resins, aluminum filled and fiberglas cloth

This address was Mr. Costanza's contribution to a panel discussion concerning high temperature epoxy resin plastic tooling at the recent Society of Automotive Engineers' Aircraft Production Forum, Los Angeles.



Gorton Pantograph Does Job in 1/5 Previous Time!

This standard Gorton P2-3 2-dimensional Pantograph, equipped with special tooling, mills 58 key lock grooves in a heat-treated aluminum alloy forging. In only 58 minutes it does a job that previously required five hours.

GORTON Pantography Means Creative Production

What's *your* problem in machining? Gorton Pantography may help you *create* a new or better production method if your problem falls into any of these categories:

OPERATIONS

INSIDE PROFILING	COUNTERBORING
OUTSIDE PROFILING	CHAMFERING
ROUTING	GROOVING
DIE SINKING	GRADUATING
MOLD CUTTING	ENGRAVING

MATERIALS

FERROUS METALS — NON-FERROUS METALS — PLASTICS

SHAPES

FLAT	UNIFORMLY CURVED
CYLINDRICAL	SQUARE
SPHERICAL	IRREGULAR

Gorton 3-dimensional Pantography operates vertically and horizontally in combination. It uses enlarged masters, templates or patterns—easily and inexpensively made. Normal operation applies the reduction ratio principle for increased work-piece accuracy —an exclusive Pantograph benefit.

Whether a dozen or a thousand pieces, each is identical in shape and tolerances to the first. Operation during cutting cycle is manual or automatic, and work pieces vary from dime size to areas as large as ten feet.

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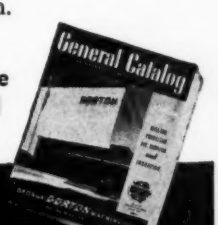

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reinforced. Attempts to cure the epoxy resins with the electric tapes were not very successful because short-circuits occurred causing power failures and blowouts in the plates.

It was ascertained that aluminum filled resins are very conductive in curing but relatively non-conductive when post-cured properly. Different combinations of resin and fillers were also tried but without satisfactory results because of the difference in thermal expansion and bond strength.

Subsequent tests showed that an unfilled "hi-temp" epoxy resin can be used when properly applied to the tapes. It is essential that the tape be impregnated using the epoxy resin with a room temperature type hardener. However, all excess resin must be rubbed out of each tape prior to imbedding it into the mold layup. Any excess resin around or within the tapes will cause expansion failure during the electrical curing of the mold or layup.

Know Power Requirements

One of the first steps to be considered in the fabrication of a mold or tool using the imbedded electric resistance tapes is to estimate the power requirements for the electric heating system. The power requirements for the fabrication of a typical radome mold with a 36" base diameter and a 39" depth is taken for illustration. The calculated watt density to maintain a maximum 300°F temperature on a 200-volt line is approximately 2.5 watts per sq. in. surface area. Based on about a ¼" spacing between tapes and the configuration of the part, 6 sections of 102" lengths of 1" tape and 18 sections of 76.5" lengths of 2" tapes were required. The total area of the tapes was 3366 sq. in. which, based on the watt density of 2.5, indicates a total of 8415 watts or 38.3 amps on a 200-volt line lead.

An excess sizing that may be present on the tapes is burnt off by placing the tapes in a 500°F oven for one or two hours.

Mold Fabrication Begins

The actual fabrication of the radome mold was started with a male plaster plug. The steps in the mold buildup followed this order: The plug was cured at a temperature between 100°-130°F for three days to insure proper dryness. Spray coats of vinyl lacquer were applied to the plaster to provide a moisture barrier seal. Polyvinyl alcohol films were next applied in spray form, followed with a thin coat of wax on the dry film. A 1/16 to ⅛" thick gel coat of catalyzed aluminum filled (high temperature) epoxy resin was applied over the entire surface and allowed to gel. Two layers of tooling fiberglas were then laid up, impregnated with the same epoxy resin mix.

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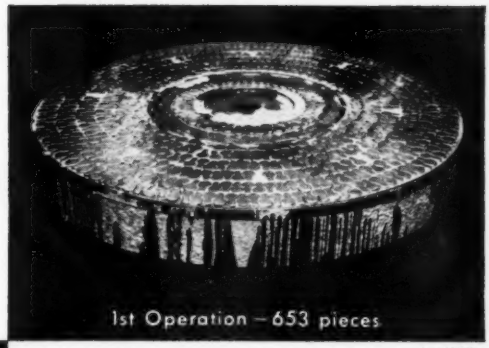
Quality Control

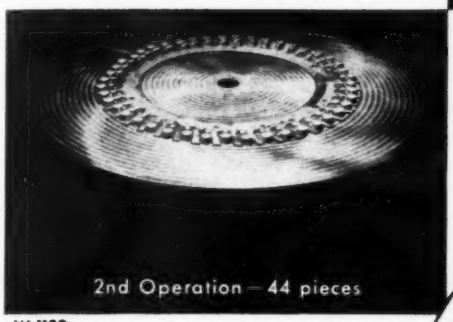
INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 12

Another example



W-1138



W-1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

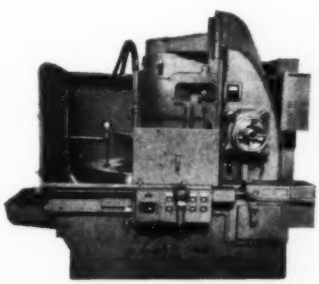
Blanchard Surface Grinders are noted for their unusual versatility—like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours—including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ± .003. Each load takes eight minutes—floor-to-floor.

As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard—whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition—recently revised.

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The epoxy resin of the glass cloth was allowed to become slightly firm before imbedding the prepared electrical tapes to insure adhesion of the tape to the mold layup.

Tape layup was started at the apex, using a section of 1" tape, of which the weft cords were partially cut. This was done to provide the tape with sufficient flexibility to conform to the contour and permit a spiral pattern of the tape layup.

All the taped sections were laid up in the same manner, allowing ⅛" to ¼" spacing between tapes.

The 2" width tapes were used in areas where the contour was not too severe. Leads were silver soldered to each tape section, and the electrical continuity was checked for each tape as soon as it was impressed into the mold layup.

Each tape was tagged or identified by number to facilitate tracing. A number of iron-constanton thermocouple tips were imbedded in the resin, between the tapes at various points, to be used for temperature indication and control.

A coating of aluminum filled high temperature epoxy resin was then spread over the entire tape layup and thermocouple. Two additional plies of tooling fiberglas cloth were next applied, impregnated with the same aluminum filled epoxy resin.

The tape leads were grouped into bundles and silver soldered in parallel to single leads and contacted to power source connectors. Several separate 220-volt power sources were required to prevent overloading the tapes. All the exposed wiring was coated with ⅛" to 1" of the filled epoxy resin.

Mold Cure Cycle

An electric continuity recheck was made on the imbedded tapes prior to the cure cycle. The mold layup was allowed to start at room temperature for 24 hours. The actual cure cycle was as follows, using a circulating hot air oven:

2 hrs @ 100°—110°F
1 hr @ 120°—130°F
1 hr @ 150°—160°F

The plaster cast was then removed from the mold before additional curing and the epoxy mold was reset into the oven in a position to permit air circulation within the interior surface of the mold. The cure cycle was completed as follows:

1 hr @ 200°—220°F
2 hrs @ 200°—320°F
2 hrs @ 400°—425°F

Mold Ready for Use

At the end of the cure cycle, the epoxy mold was allowed to cool in the oven to minimize thermal shock. The cured epoxy mold was then set into the prepared support fixture. The power controls were hooked to the 220-volt lines in the circuit breaker, and the themocouple leads to the Speedomax graphic recorder to complete the power circuit.

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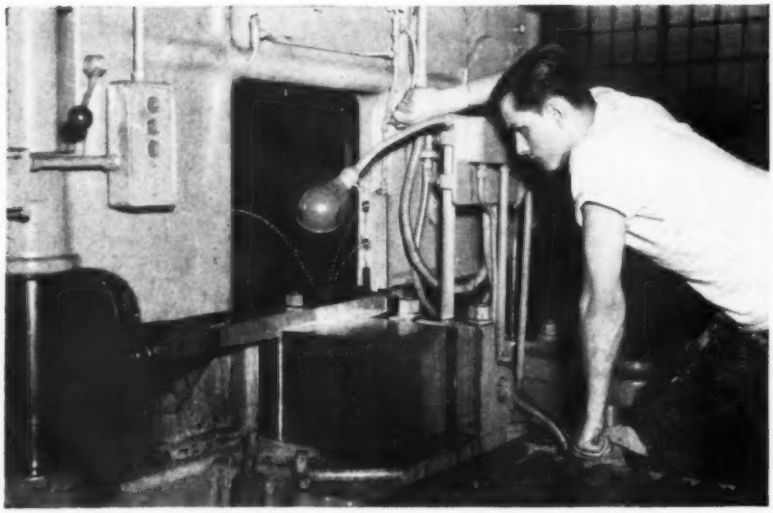
CIRCLE INFORM-A-GRAM KEY NO. 15

BOOST YOUR CUTTING PRODUCTION WITH BARNES ROCKET POWER BLADES



Barnes' exclusive manufacturing processes have "locked in" all the basic requirements of a top-quality hack saw blade—AND MORE!

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CIRCLE INFORM-A-GRAM KEY NO. 16

The contact acrylic forming tool and the match mold were fabricated by essentially the same process employed for the radome mold. The main difference was that a high temperature black epoxy gel coat was used in these tools to permit a high lustre surface. The addition of a 356 T Dural bar in the match mold is under investigation. It is contended that the aluminum bar core will minimize use of layup materials and time and also provide more uniform heating and greater rigidity in the mold. It must be considered that these latter molds and tools are still in development and, therefore, no definite conclusions can actually be made at this time.

Presently these aluminum filled epoxy resins must be fully cured before the electric current can be applied to the tapes. Conductivity tests must be made to minimize short-circuit and blowouts. There is a definite need for high temperature epoxy resins, filled or unfilled, which can be utilized as tooling materials with minimum or no shrinkage, no warping, and temperature deformation resistance of about 500°F. Some of the new epoxy formulations are being investigated to ascertain their use as high temperature tooling materials.

Although there are still some obvious unknowns in the use of these epoxy resins, there is sufficient justification from the progress and developments made to date to continue the project of using the high temperature epoxy resins and the electric resistance tapes for plastic tooling applications.

Cooler Resinoid Grinding Wheels

Porous filler that breaks under impact and opens up pore spaces is providing cooler-cutting action and longer life in new resinoid grinding wheels.

A development of Electro Refactories & Abrasive Corp., Buffalo, N. Y., the self-dressing wheels are said to be so cool cutting, they will not affect the temper of metal being ground at high speed. Special lightweight cellular glass fragments provide the new approach to pore spacing. The wheels are reported to have twice the life of conventional napthalene filled resinoid units because of the uniform pore spaces.

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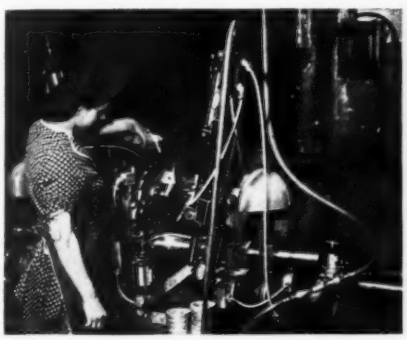
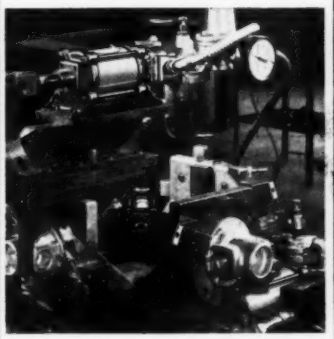


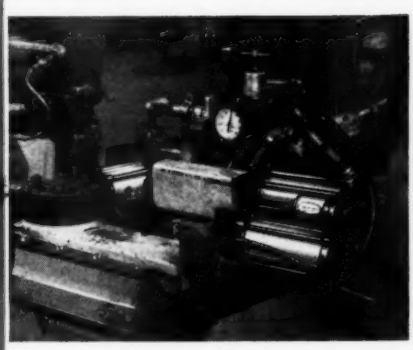
THREE PIECES FOR THE COST OF ONE

This special machine drills two die castings for vacuum cleaners at one time. Eight holes are drilled in one, thirteen in the other. Two Bellows Air Motors and two Drill Press Feeds do all the work — the operator only loads and unloads work pieces.



FINISHING OPERATIONS DONE 2½ TIMES FASTER

Two Bellows Air Motors and a Rotary Feed Table made the difference. This shop-built machine drills, bores, and faces aluminum gas regulator bodies.



DIRECT COSTS CUT FROM 17.4c TO 14.3c

Two Bellows Air Motors were installed on this turret lathe to control cross-slide and turret actions. Inside and outside diameters are finished and threads rolled on die cast temperature regulator parts.

Here are three actual cases of large cost reductions made in woodworking operations. In each case savings have been made by using one or more Bellows Air Motors . . . to replace slow, manual methods, or to combine separate, related operations into one efficient, economical process.

Such conversions are inexpensive and amazingly easy. For the Bellows Air Motor is a unique and different air cylinder. It is a power unit complete in itself — with all controls built-in. Advance and retract speeds are independently adjustable. Built-in 4-way valves, in a wide choice of electrical, pneumatic, or manual controls, provide the type of control needed for each job. Only one air connection is required, and that can be made with flexible hose. Bellows Air Motors are easily interlocked for automatic sequencing of work movements.

With these facts in mind, take a new look at your own shop. Wherever you see an operator's hand or foot moving a crank, wheel, lever, or pedal back and forth . . . back and forth, you see a high-cost operation. In nine out of ten such cases a Bellows Air Motor can do the job faster, better and far cheaper.

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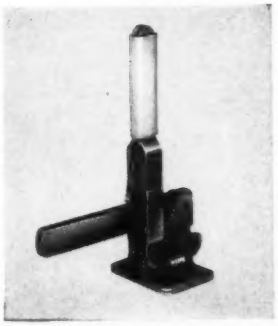

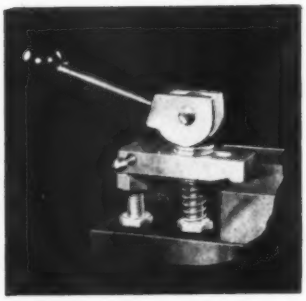

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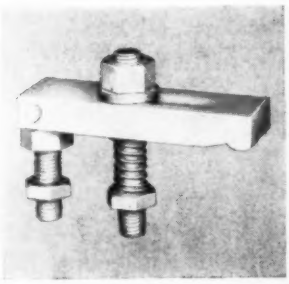

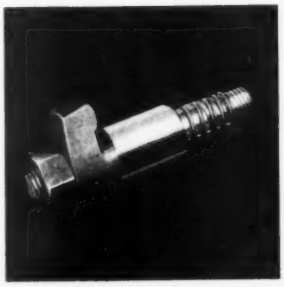

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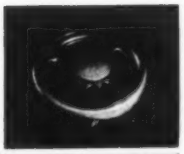

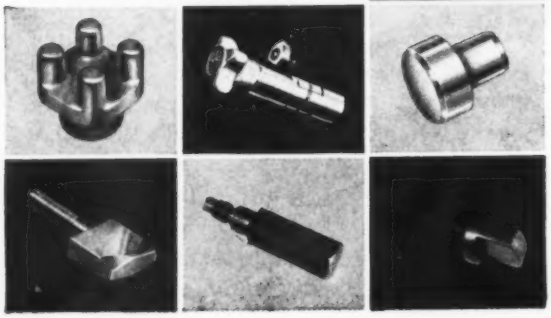

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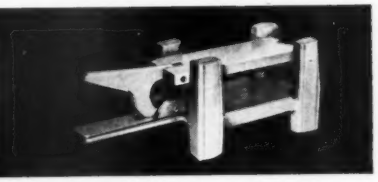

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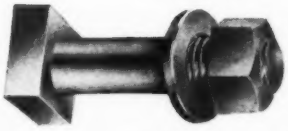

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New! —SAVES TIME!

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New! —SAVES AIR!

Stroke change quickly made with spanner wrench (included with cylinder). You can conserve air in large fixtures (where dozens or hundreds of Midget Air Clamp cylinders are used) by using "just enough-no more" stroke. The shorter the stroke, the faster the cycle.

New! —SAVE SPACE & MONEY!

You can shorten stroke to the minimum to save space in cramped quarters. The cylinder "nose" telescopes into barrel reducing stroke and overall length. All this at prices so low you can almost *forget* their modest first-cost. But you'll *remember* the countless man-hours saved—the lessened fatigue of your workers at monotonous jobs—the improved quality and accuracy of their work!

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(See Alphabetical Index of Thomas' Register for address, phone number.)

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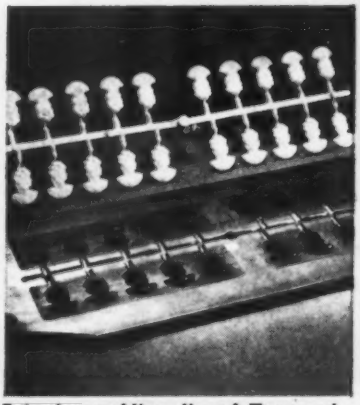
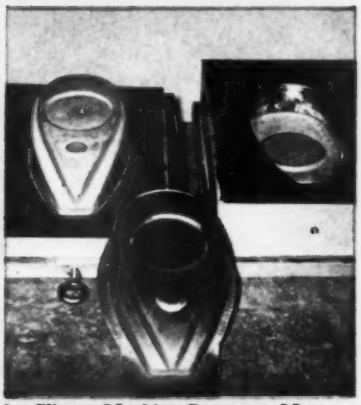
How much money can



Injection molding dies of Epon resin (left) reduce costs 80% for Adams Plastic Products, Cincinnati, Ohio. Duplicate patterns (center) are made to close

tolerances with Epon resin by Crane Company, Chicago, Ill. Epon resin dies for outboard motor housing (right) are one-third cost of comparable metal dies



for Clinton Machine Company, Maquoketa, Ia. Formulations for these three applications supplied by Kish Industries, Inc., Lansing, Mich.

Epon resin gives you these advantages for making tools and dies . . .

- Cast and cured at room temperature . . . no special equipment needed
- Cast to close tolerances . . . less machining and handwork
- Easily duplicated and altered . . . short production time

Epon resins are the epoxy polymers made exclusively by Shell Chemical Corporation.

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EPON® RESIN

to make TOOLS and DIES?

New resin can reduce tool production costs by 80%

PLASTIC TOOLING now has graduated from the short-run experimental stage to the profitable production stage . . . thanks to the unusual physical properties of Epon resin.

Saves time and labor

Little machining and handwork are required to finish Epon resin tools, dies, and patterns, because the material can be cast to very close tolerances. No specialized equipment is needed, because Epon resin tools are cured at room temperature.

Tools resist wear

Other advantages of Epon resin tools are that they withstand great pressures, are unaffected by chemicals and a wide range of temperatures, and maintain a high resistance to abrasion and corrosion.

Where Epon resin tools are used

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Find out more

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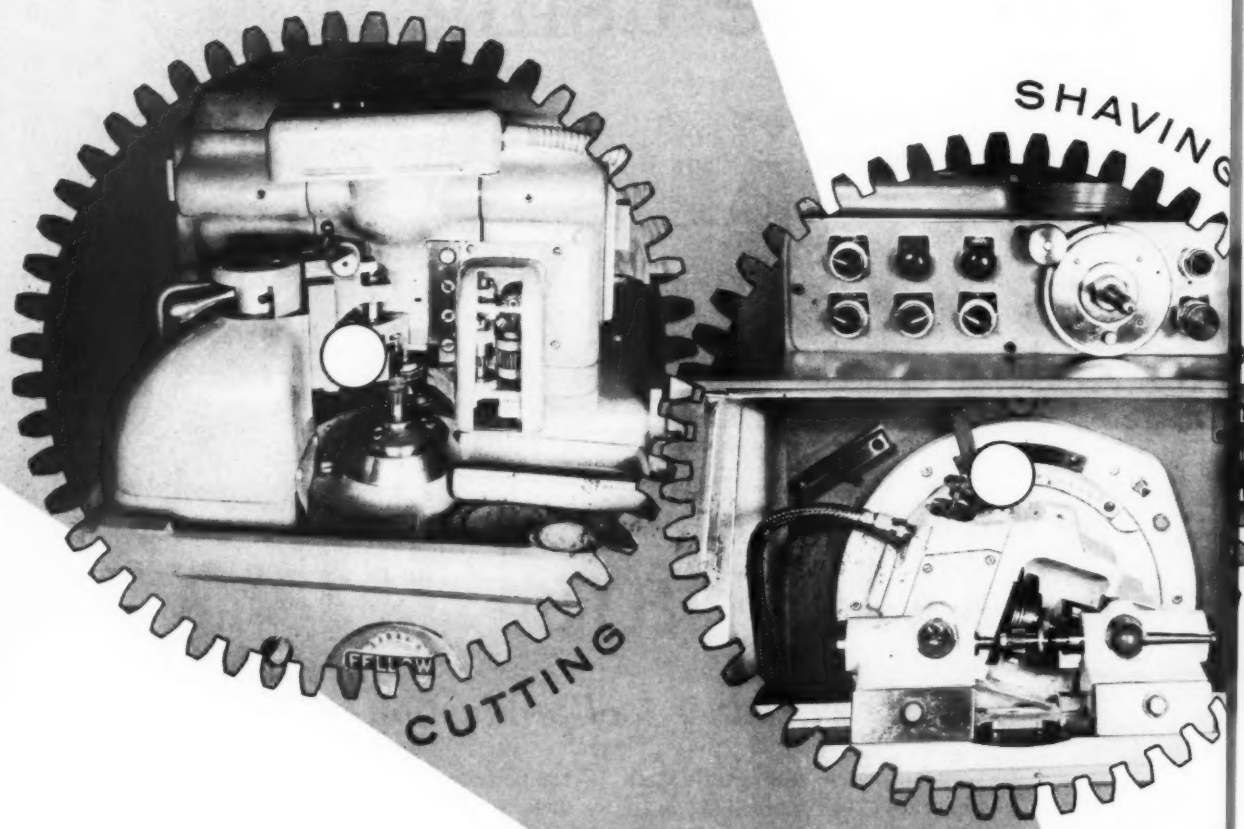
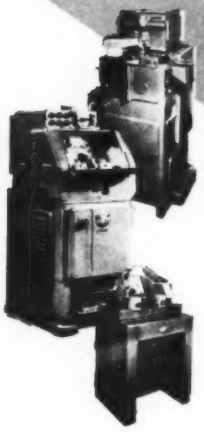
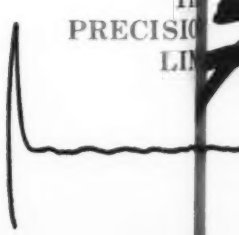




Fellows 3-Inch Gear Shaper will handle work from 1/16" to 3" pitch diameter and as fine as 200 pitch on spur gears. It provides for unusually high speeds...automatic deburring, too.

Fellows No. 4 Gear Shaving Machine provides the fastest possible finishing on spur and helical gears from 1/16" to 4" pitch diameter, 1" face width, 20 diametral pitch and finer. The last word in quality.

Fellows No. 4 Red Liner is especially adapted to the "composite check" of fine-pitch precision gears. Electrical recorder amplifies errors 200, 400 or 800 to 1 and records them on a paper chart. Very fast!



TH
PRECISIO
LI

PRODUCTION

FOR FINE-PITCH GEARS, TOO

At the NMTB Show, gear men had the opportunity to see for themselves how quantity production of high precision fine-pitch gears can be achieved at low cost. Using a Fellows 3-Inch Gear Shaper, No. 4 Fine-Pitch Gear Shaving Machine and No. 4 Red Liner... all fully integrated... production speeds can be obtained that a short time ago were considered impractical. Simultaneously, close tolerances can be assured which will meet the most exacting gear-train requirements for electronics and instrumentation.

If you are interested in fine-pitch gears... either as a producer or user, or both... it will certainly pay you to get all the facts about Fellows line of fully integrated equipment. WRITE, WIRE or PHONE any Fellows Office today!

THE FELLOWS GEAR SHAPER COMPANY.
Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45.

Fellows *Gear Production Equipment*

CIRCLE INFORM-A-GRAM KEY NO. 23

CUSTOMER
SPECIFIED
Color indicates machined surfaces
A leading automotive manufacturer recently specified a multi-purpose production machine to perform a combination of rough and finish milling, horizontal and vertical drilling operations. Specifications called for a single machine that would do all these operations with increased efficiency and lower production costs.
Quill Feed Unit
Lead Screw Tapping Unit
Way-Type Drill Unit

Kearney & Trecker offers you standard

Illustrated here are several standard units which Kearney & Trecker incorporates in automatic production machines that perform a combination or series of drilling, milling, boring and tapping operations to exacting accuracies.

Kearney & Trecker combines these standard design units with a minimum of special engineering to keep production machine costs at a minimum. What's more, you get increased production at lower cost and higher efficiency. Such utilization of standard units provides the economies you want, from job-proven designs with minimum of capital investment.

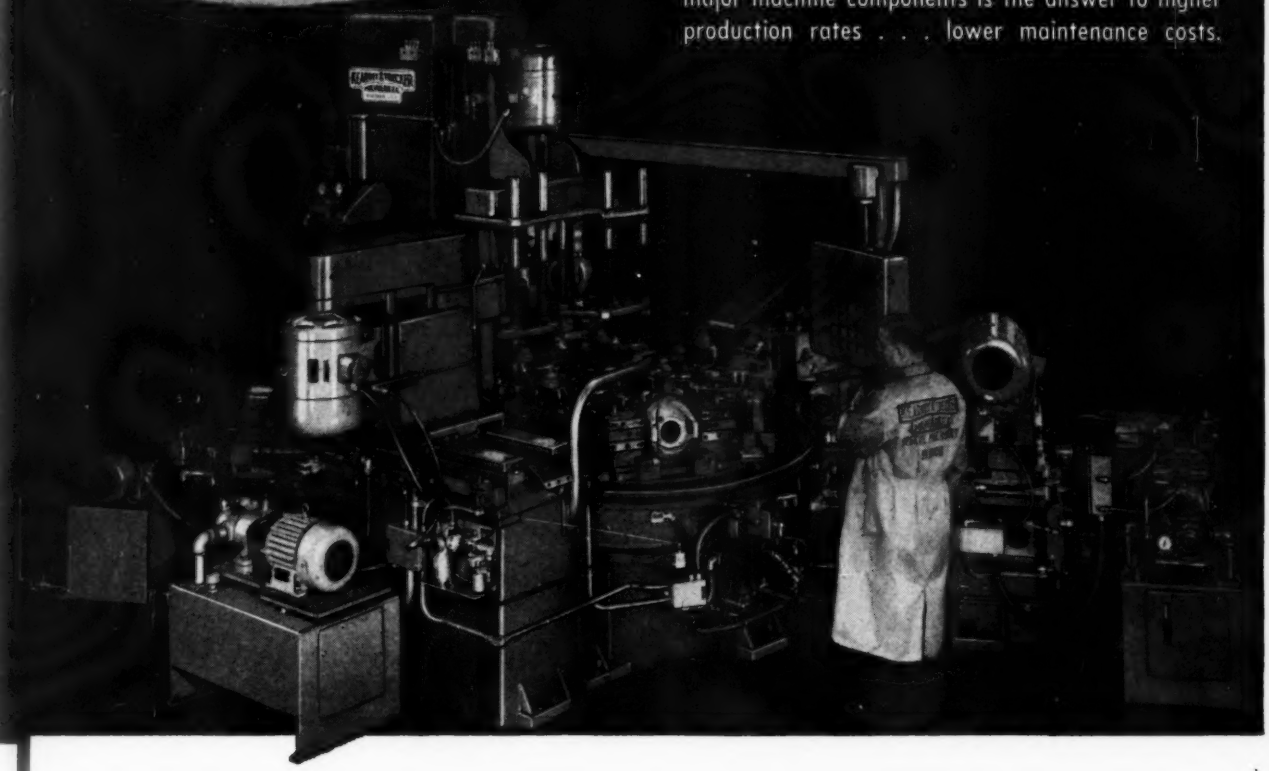
Standard Feed Slide Unit — One of the most important developments, the Model B Feed Slide provides hydraulic feed for milling, boring or drilling heads. Available in four sizes (determined by width of ways), and each size in four different length cylinder strokes. A variety of feed cycles is possible — single, fine and coarse, single skip, double skip and feed return. (Data Sheet No. 1019a.)

Standard Quill Feed Unit — Simplifies and speeds production of machines which perform drilling, boring, reaming, counterboring and chamfering operations. There's 10″ stroke and a spindle speed range of 200-1690 rpm, which is variable by change gears and sheave diameters. Single or multi-spindle arrangements are possible as well as single or double feed rates. (Data Sheet No. 1055.)

Standard Rotary Index Table — Designed especially for production machines, the Rotary Index Table is a rugged, accurate, self-contained unit for mounting various work-holding fixtures. Unit is available in four

KEARNEY & TRECKER MILWAUKEE DESIGNED

Kearney & Trecker designed and built this 6-Station Rotary Indexing machine — incorporating nine standard units — to perform a series of milling and drilling operations on rear axle differential carriers at the rate of 82 pieces per hour. Five feed slides, one quill feed unit, two drill power units, and a rotary index table are used. Such standardization of major machine components is the answer to higher production rates . . . lower maintenance costs.



units for lower production machine costs

different table diameters — 36″, 48″, 60″ and 80″. (Data Sheet No. 1018a.)

Standard Way-Type Drill Unit — Designed for drilling, boring, reaming, counterboring and chamfering operations with heavy cutting loads. Entire unit can be mounted at any angle on a production machine. Single or multiple-spindle arrangements as well as single or double feed rates are possible. Completely self-contained spindle head has a speed range of 98-1691 rpm, with 72 increments . . . feed range of 1-16 ipm . . . 140 ipm rapid advance and 260 ipm rapid return. (Data Sheet No. 1075.)

Standard Tapping Unit — This compact, self-contained unit can be arranged to tap any thread from ¼″ to 1″ in diameter in both national coarse and fine series, in addition to six sizes of pipe taps. Spindle speeds range from 80-280 rpm with a choice of three motors, 1, 2 or 3 hp. Single as well as multi-spindle arrangements are possible. (Data Sheet No. 1074.)

For more complete information on standard units, ask for Data Sheets listed under each unit; for details on the 6-Station Rotary Indexing machine, utilizing nine standard components, request Data Sheet No. 1076. See our nearest representative, or write Kearney and Trecker Corp.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 25

HARDINGE-SJOGREN

HARDINGE
ELMIRA, N.Y.

SPEED

Collet Chucks with HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

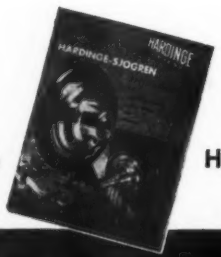
for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge **Steel** Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both **short** and long lengths properly.

. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

Write for Bulletin 8— complete information on



HARDINGE-SJOGREN Chucks and Collets.

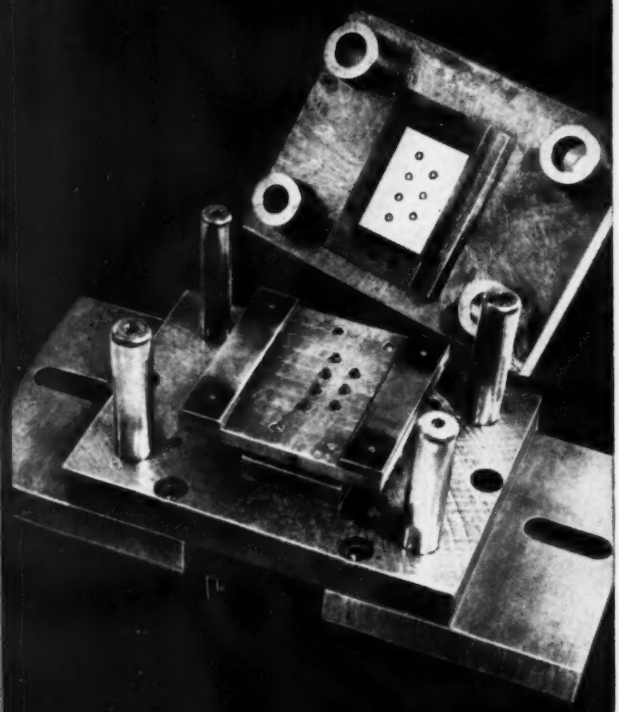
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 26

FIELD REPORT: NO. 87



WHICH DIE STEEL WOULD YOU USE HERE to boost production per grind 500%?

These tools blank out dead soft brass washers, .170" O.D. x .100" I.D., .009" thick, on a punch press at 186 strokes per minute. It is an exacting job for a couple of reasons. First, it involves a government contract and strict delivery schedules have to be maintained. Then too, the punch and die are set up to blank seven washers per stroke and have to do this for many millions of pieces . . . and still remain within burr limitations set up by the government. Performance from the steel used in the past was far from satisfactory . . . to maintain schedules, production had to be substantially increased.

Suppose the decision were up to you. Which die steel would you be willing to recommend for steady, trouble-free production?

In this Field Report from customer files, here's what happened: The Carpenter Matched Set Diagram was consulted and Carpenter No. 610 (Air-Wear) was selected. Since then No. 610 has enabled the Company to hold delivery schedules comfortably . . . racking up increases in production per grind as high as 500%. And this is especially significant when you realize that five hours' downtime is involved each time the tools have to be reground. Total parts to date: 5,500,000 . . . and the tool is still good for about 15 regrinds of .003" each.

Why make the tough decisions alone, when Carpenter's service organization is sincerely interested and equipped to work with you? A move in the right direction would be to call your nearest Carpenter Mill-Branch Warehouse, Office, or Distributor, now. *The Carpenter Steel Co., 106 W. Bern St., Reading, Pa.*

Your toolroom can use Carpenter Matched Tool and Die Steels to:

Reduce hardening hazards
Minimize machine downtime
Boost output per grind
Improve product quality

Carpenter STEEL

Matched Tool and Die Steels

IMMEDIATE DELIVERY from local warehouse stocks—Export Address: Port Washington, N. Y.—"CARSTEELCO"

SPECIAL MARKING MACHINES

by Parker

Vaccinate HYPODERMIC NEEDLES

. . . by the thousands . . . with precision
. . . and economy!

Pharmaceutical people lay down the most exacting requirements. That's why Parker was given the challenge to design and build this super-special marking machine. Dial operated, it marked 60 needle holders per minute—no trial and error—every impression perfect! That's our story. What's your problem? Parker can do the same for you.

To protect your **MARKET . . . Mark it!**

Send today for literature on the complete line of Parker marking machines and accessories.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

"Commendable Comments"

"Advances in engineering and in our efforts to utilize these advances for a more abundant life depend extensively upon our ability to measure the properties of materials."

—Allen V. Astin, Director of National Bureau of Standards in a talk given at the Fritz Engineering Laboratory, Lehigh University, Bethlehem, Pa.

". . . our common sources of power, our everyday fuels such as coal, natural gas and petroleum, are being consumed at an alarming rate, and they are not being replaced by any natural or man-made physical or chemical cycles . . . the potential capabilities of other sources of energy, such as wind power, tidal power, nuclear energy and solar energy, are now being studied to a far greater extent than ever before by scientists and engineers who are now much better equipped with scientific background data for such research than in the past."

—By R. C. Allen, Director, Mechanical Engineering, Allis-Chalmers Mfg. Co.

"In this connection it is well to remember that standards not only for equipment but for the gears themselves will be affected by automation. As an example, our own engineers are now in the midst of preparing a new set of standards for rolled splines and serrations. These standards will be presented to the American Gear Manufacturers Association and American Standards Association for their consideration. Their adoption will facilitate forming of the teeth and assure improved physical qualities for the splines."

—By M. R. Anderson, Executive Vice-President, Michigan Tool Co. at the Diamond Jubilee Meeting, American Society of Mechanical Engineers.

"The stage is set for the marriage of two techniques — the technique of the process engineer and the machine tool builder with the technique of the inspector and the gage maker. This can bring forth a broad area of automatic control that can influence our entire concept of manufacturing. With the confluence of these efforts, a machine can be created that can be told what to produce and that can be given the opportunity to correct itself. Self-inspection and self-correction; automatic manufacture, automatic inspection and automatic correction of errors!"

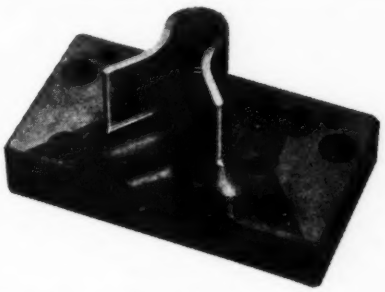
—By Jacob J. Jaeger, Vice-President Pratt & Whitney Company, Inc. at the New England Conference of the American Society for Quality Control in Hartford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 28

YOU GET SPEED PLUS ACCURACY WITH MOORE JIG GRINDERS

HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¾ hours.*



CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

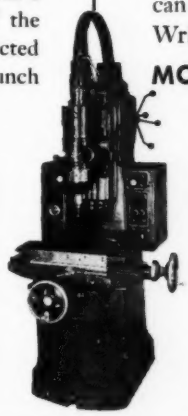
The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Ave., Bridgeport 7, Conn.

"HOLES, CONTOURS AND SURFACES
is bound to become a classic to the man or shop that does accurate work."
American Machinist Book Review
424 pages — $5 U.S.A., $6 elsewhere



NO. 2 MOORE JIG GRINDER
Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up and down; spindle-housing heat control. Features slot grinding attachment.

ADD MOORE TOOLS TO YOUR TOOLROOM
JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

CIRCLE INFORM-A-GRAM KEY NO. 29

"Home-made" Automatic Drill set-up cuts drilling cost from 2¢ to 1/10¢ per piece

Two standard Dumore Automatic Drill Units plus low-cost tooling boosts production for midwest die cast firm.

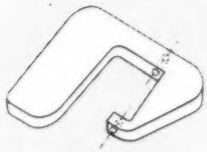
When Acme Die Casting Corp., Racine, Wisc., bid on a die cast zinc automobile door lock, their price hinged on maintaining high production rates on every phase of the operation. However, when hand drilling two opposed .160" holes, they found it impossible to hold the necessary .002" alignment tolerances as well as maintain the required high hourly production. They began looking for a solution.

Uses Dumore Advisory Service

Working closely with Dumore's Application Advisory Service, the company devised the special purpose machine pictured below. It consists of two Dumore Series 24 Automatic Drill Units designed into a completely automatic set-up that amounted to only a few hundred dollars in tooling and fixture costs. Complete synchronization of stroke, feed and drilling is made possible with effective use of micro-switches.

From 150 to 1500 pieces per hour

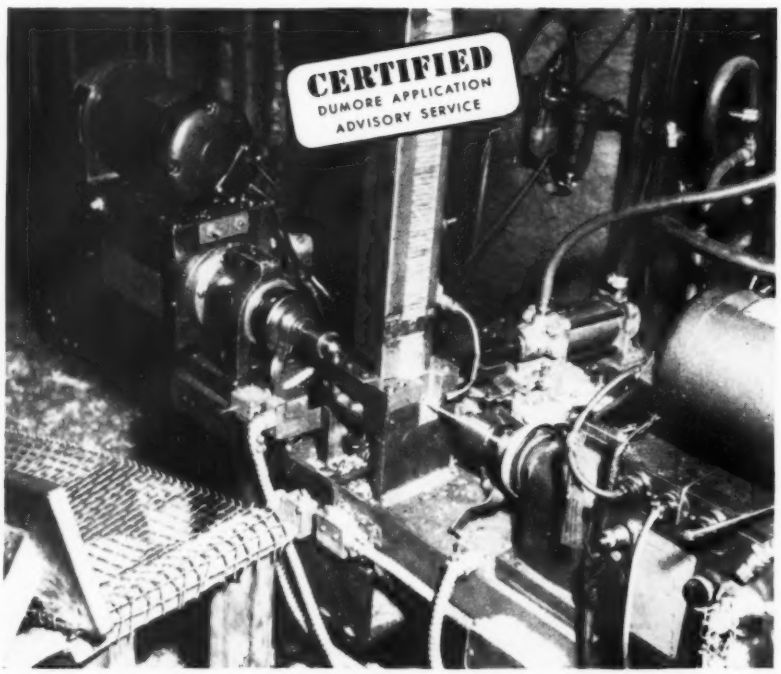
By increasing production from 150 to 1500 pieces per hour, drilling costs were reduced from 2c to 1/10c per piece. Operating at three shifts per day, the Dumore Units and tooling paid for themselves within a matter of weeks.

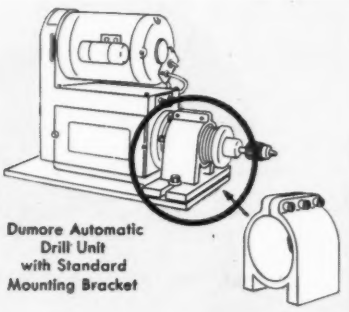


PART: Zinc Die Cast Automobile Door Lock.

OPERATION: Drill two opposed .160" holes, hold alignment within .002", parallelism .0015".

PRODUCTION: 1500 pieces per hour, or 25 per minute.





Dumore Automatic Drill Unit with Standard Mounting Bracket

QUICK REMOVAL and transfer of Dumore Units to other parts of the shop for drilling, tapping, reaming and other related operations is made possible with their unique nose mounting bracket. It quickly adapts Unit at any angle to existing shop equipment.

AN INEXPERIENCED OPERATOR loads the hopper while gravity feed forces the piece into the drilling fixture. The two opposed Dumore Automatic Drill Units advance simultaneously, drill, then retract to starting position—all automatically. The Dumore's built-in electrical and pneumatic controls permit almost unlimited set-up and production possibilities.

Let Dumore's Application Advisory Service help you get increased production and lower costs on jobs like this. Write for FREE Dumore Application Analysis Kit.

DUMORE
PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1304 SEVENTEENTH ST., RACINE, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 30

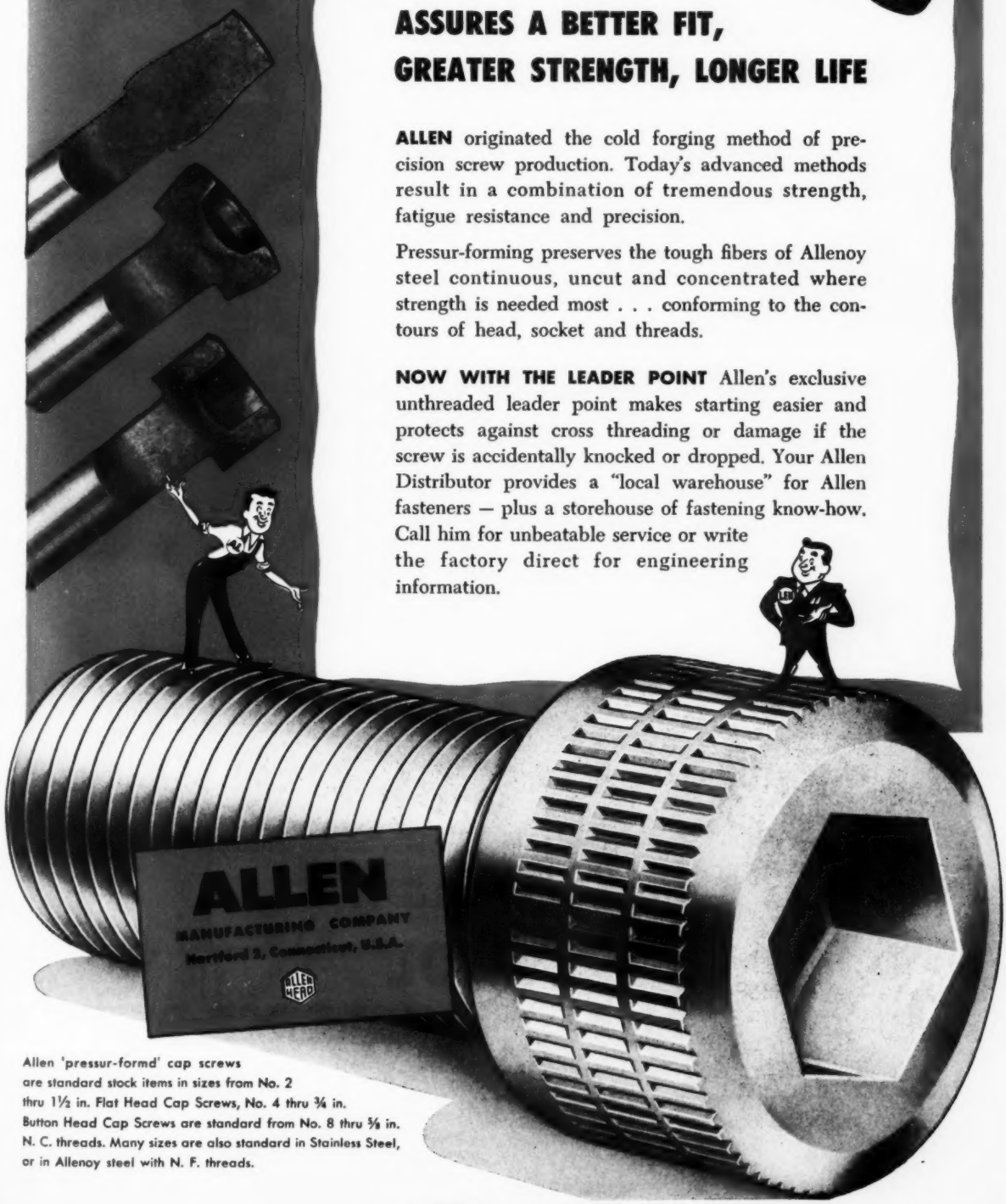
Pressur-Forming

ASSURES A BETTER FIT, GREATER STRENGTH, LONGER LIFE

ALLEN originated the cold forging method of precision screw production. Today's advanced methods result in a combination of tremendous strength, fatigue resistance and precision.

Pressur-forming preserves the tough fibers of Allenoy steel continuous, uncut and concentrated where strength is needed most . . . conforming to the contours of head, socket and threads.

NOW WITH THE LEADER POINT Allen's exclusive unthreaded leader point makes starting easier and protects against cross threading or damage if the screw is accidentally knocked or dropped. Your Allen Distributor provides a "local warehouse" for Allen fasteners — plus a storehouse of fastening know-how. Call him for unbeatable service or write the factory direct for engineering information.



Allen 'pressur-formd' cap screws are standard stock items in sizes from No. 2 thru 1½ in. Flat Head Cap Screws, No. 4 thru ¾ in. Button Head Cap Screws are standard from No. 8 thru ⅝ in. N. C. threads. Many sizes are also standard in Stainless Steel, or in Allenoy steel with N. F. threads.

CIRCLE INFORM-A-GRAM KEY NO. 31

ANNOUNCING

New Keller Portable Air Drills!

with 10 outstanding features that production men know will increase output . . . reduce costs.

- **MORE POWER**—Newly designed side air intake and exhaust porting provide for greatly increased power. Capacities up to ¼"—5/16".
- **LIGHTER WEIGHT**—Advanced engineering enables weight reduction along with greater power.
- **GREATER RANGE**—Provides speed-torque range from 600 to 17,000 rpm to meet practically all drilling requirements.
- **QUIET OPERATION**—Quietest drill with adjustable exhaust deflectors. Noise level is reduced by controlling the exhaust without sacrificing power. Operator fatigue caused by high noise level is minimized.
- **BALANCED DESIGN**—Shape provides utmost operator comfort and ease of handling.
- **SMALL SIZE**—Body diameter only 1½" with ¾" spindle offset.
- **SUSPENSION BAIL**—Standard equipment.
- **INTERCHANGEABLE PARTS**—Interchangeable gears, spindles, and chucks afford quick conversion to new jobs.
- **ONE-SHOT LUBRICATION**—With flush type fitting.
- **LOW AIR CONSUMPTION**—Side air intake and large exhaust parts provide low air consumption and more efficient operation.

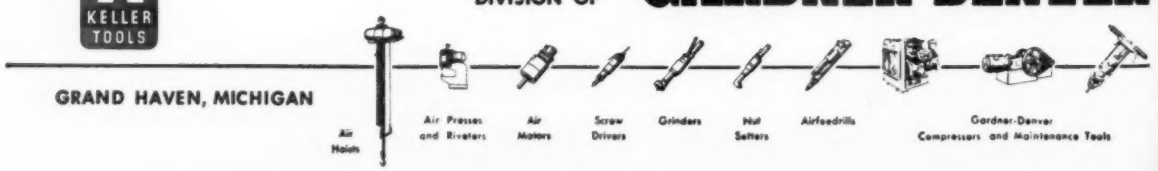
Write for Bulletin 11A giving complete information about these all-new KELLER Air Drills.

GARDNER-DENVER Since 1859 K KELLER TOOLS

KELLER TOOL

DIVISION OF **GARDNER-DENVER**

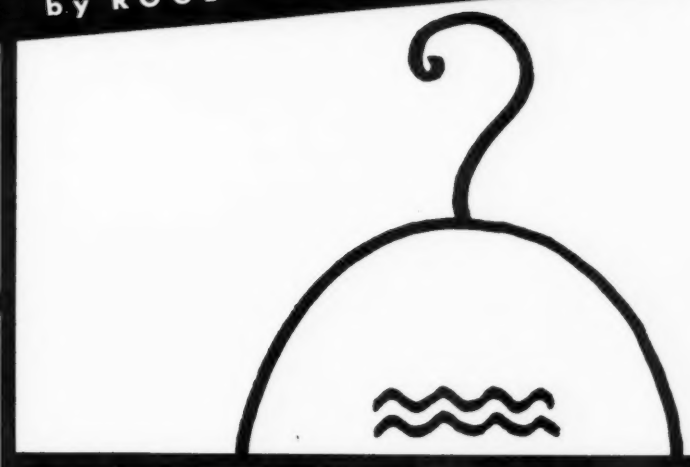
GRAND HAVEN, MICHIGAN



CIRCLE INFORM-A-GRAM KEY NO. 32

DROODLES

by ROGER PRICE



Bench Model BC-14D

Floor Model FC-30

Floor Model FC-14

"PUZZLED BABY"

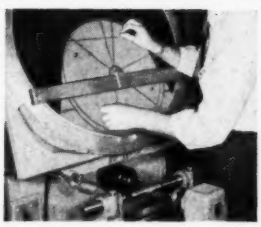
You'd be puzzled, too, if your dad presented you with a bottle of *powdered* milk. Don't blame father, though . . . he's a Quality Control Engineer who's at his wit's end because of difficult inspection problems.

Happily for him . . . and the baby . . . we're in a position to help, by introducing him to the J&L Optical Comparator. This inspection device — so fiendishly ingenious that it should have been invented by me — inspects and measures all sorts of parts and objects, in a range of sizes.

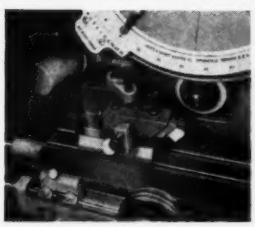
The J&L Comparator makes speedy production-line inspection a cinch, it's hellishly accurate (to .0001"), and enables you to perform inspections that are not possible with any other method. Here is an instrument that's well worth your looking into (pun, 2nd class). For complete information, send this coupon *today*. We'll give your inquiry immediate attention (1st class).

JONES & LAMSON OPTICAL COMPARATORS

Precise . . . Rapid . . . Flexible . . . Easy to operate



Inspecting location of ball contact points in steering worms, plus thread forms, solves a critical problem for the automotive industry.



A J&L Comparator is used as a gauge to set and control limits of pre-set tooling for automatically controlled machining cycles.

J&L Comparator bends stamped parts to close limits — unattainable in regular process. Also inspects the parts in all planes in the same operation.

J&L JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vermont, U. S. A.

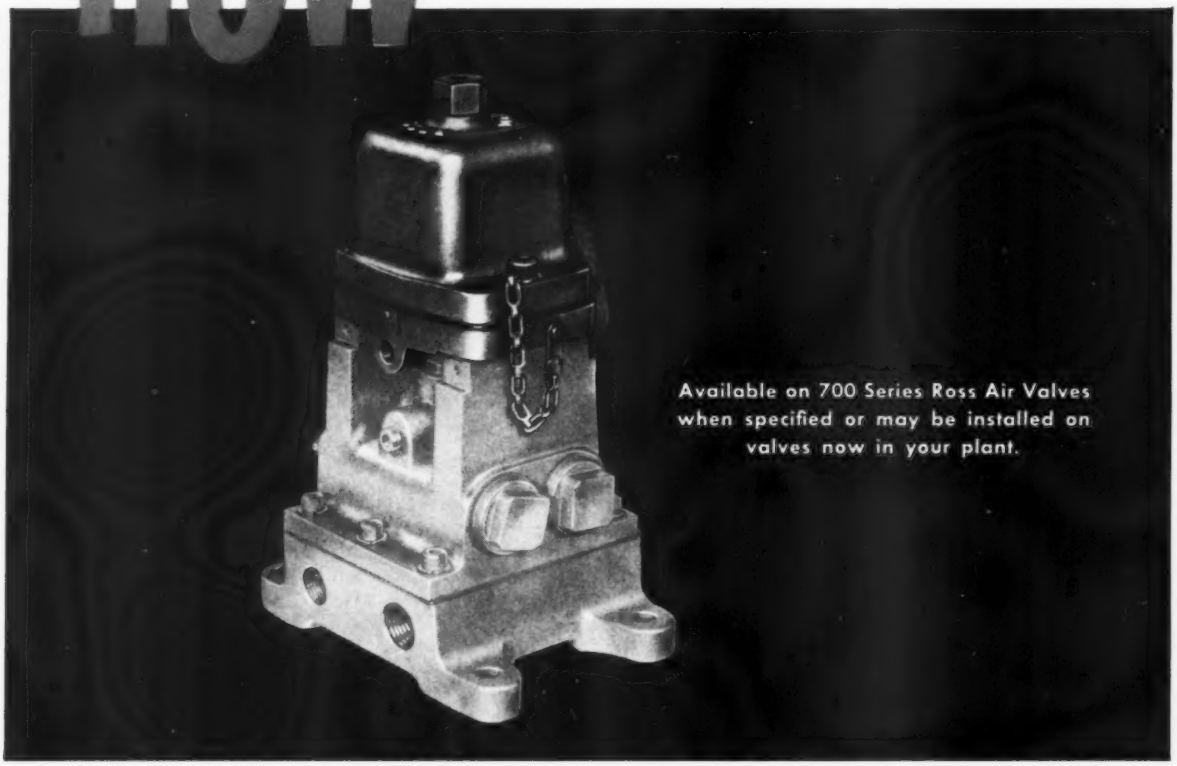
Please send me Comparator Catalog 402-C, which describes the complete J&L line of optical comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____

CIRCLE INFORM-A-GRAM KEY NO. 33

new JIC Solenoid and Cover!



Available on 700 Series Ross Air Valves when specified or may be installed on valves now in your plant.

- Cover protects solenoid against dust, splashing liquids and airborne contaminations.
- Can be manually operated without removing cover.
- Ample wiring connection space.
- Ring type pressure connectors.
- Interchangeable with standard Ross cover and solenoid.
- Valve becomes electrically inoperative when cover is removed.
- Captive type cover fasteners.
- Chain to prevent loss of cover.
- Threaded electrical conduit connection.
- Provision for piped exhaust.

- JIC Solenoid Cover and Head Assembly also available for 700 Series Momentary Valves.

Tomorrow's Engin*AI*Ring Delivered Today . . . Anywhere

ROSS Control VALVES

Ross OPERATING VALVE COMPANY

123 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 34

The NEW

SERIES "N"

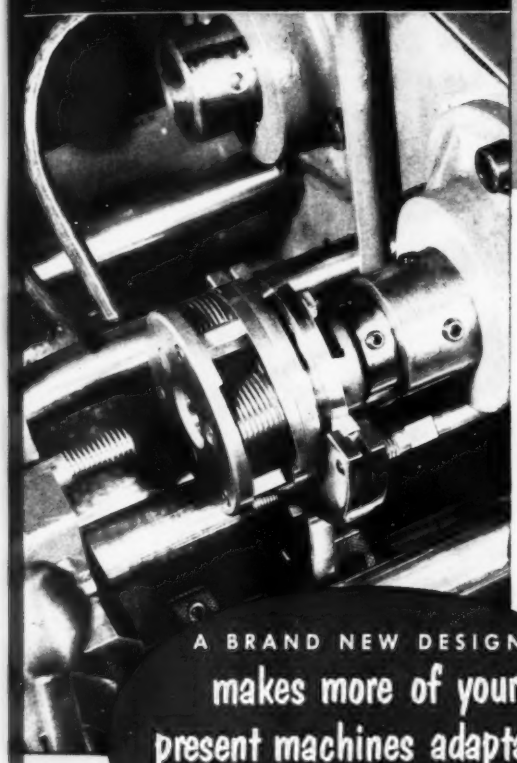
NATIONAL ACME "FETTE"

Self opening

THREAD ROLLING HEAD

for ROTATING and NON-ROTATING Spindles

AS A ROTATING HEAD — Resetting mechanism is operated by a yoke, with handle removed.



A BRAND NEW DESIGN!
makes more of your present machines adaptable for ROLLING threads

the same head works either way!

AS A NON-ROTATING HEAD — Resetting mechanism is operated by handle.

Hard to beat.. *for producing accurate, long-wearing threads*

. . . for long runs or short runs . . . for economy . . . for adaptability

The National Acme Company

169 EAST 131ST STREET • CLEVELAND 8, OHIO

NEW

FRONT-TO-BACK CRANKSHAFT DESIGN

embraces numerous operating and structural improvements

Of far reaching importance, the development of Niagara's impressive, new Styleline Deep Throat Presses has opened the way to numerous operating and structural advantages. Barriers imposed by conventional side-to-side crankshaft arrangements and outmoded end wheel designs have been shattered. The Niagara-developed front-to-back crankshaft design introduces a new concept of deep throat press performance and economics:

MODERN, SPACE-SAVING, ENCLOSED CONSTRUCTION

The entire driving mechanism is within the limits of a compact, all-steel frame. There are no exposed, overhanging parts and mechanisms to obstruct crane service, block light, throw grease and consume floor space unnecessarily.

LONGER DIE LIFE, GREATER ACCURACY

Increased distance between gibs makes possible a wider slide (left to right) for greater support to wide dies. Longer gibs assure accuracy for the full stroke.

MINIMIZED SHAFT DEFLECTION AND GEAR WEAR

With all gears located inside the press frame and overhung bearings eliminated, damaging shaft deflection is held to a new minimum. Both pinion and gear are more rigidly supported to withstand maximum loading with minimum wear.

PROLONGED GEAR AND CLUTCH LIFE

Gears and clutch members, all neatly housed in the crown, operate in sealed baths of oil to assure longer service life.

Built in a large range of sizes and throat depths, these modern, Styleline Series C Presses reflect the latest thinking of Niagara engineers . . . today as always, pace-setters in power press advancement.

HERE'S THE WHOLE STORY ON WHAT THESE MACHINES CAN DO FOR YOU

Get all of the facts. Check the specs! Write for new, illustrated Bulletin 61 today. It will be mailed promptly without obligation.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

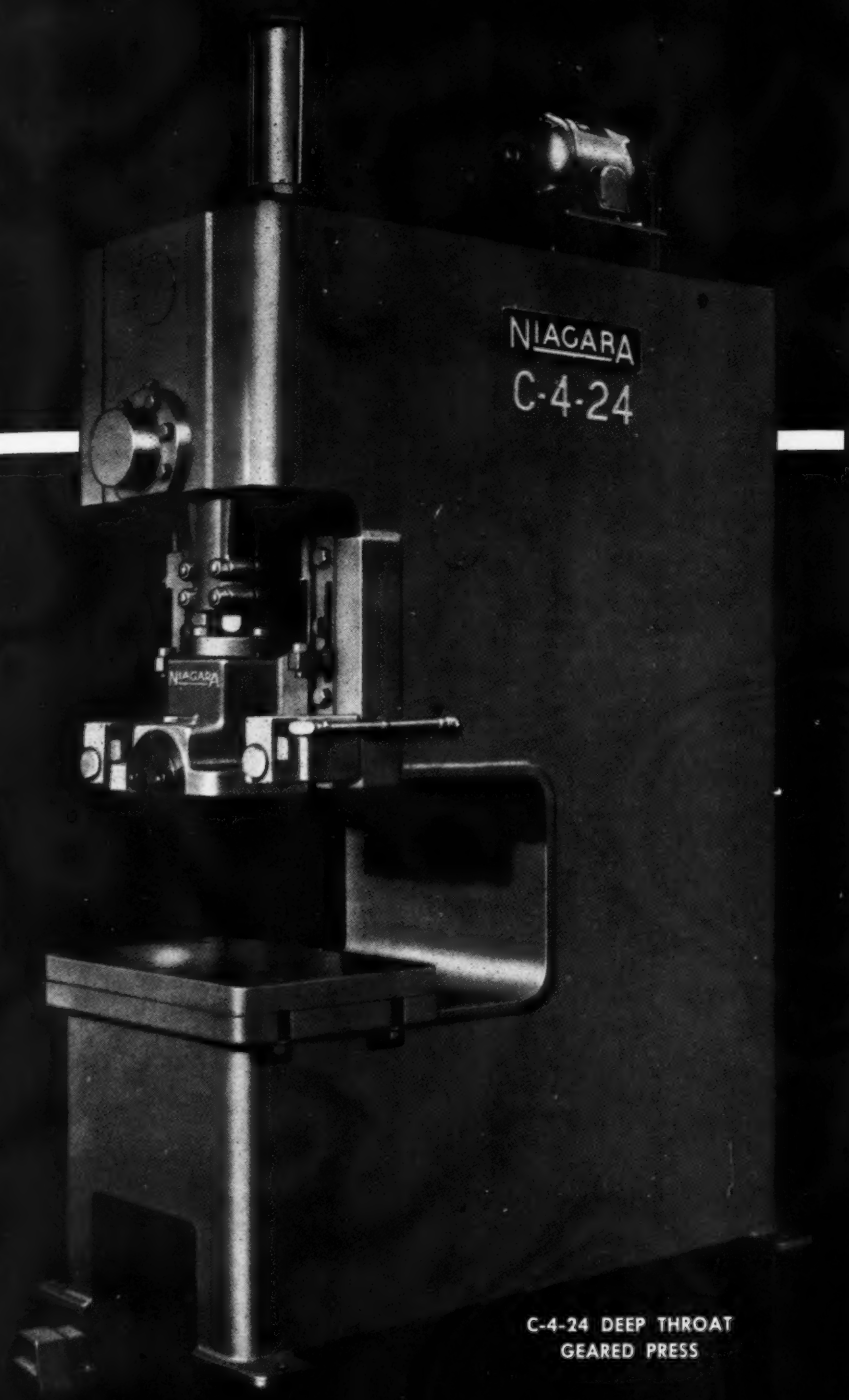
DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

NIAGARA

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work



C-4-24 DEEP THROAT
GEARED PRESS

Air counterbalance offsets weight of slide, die and connections.

No overhanging motor, belts, flywheel, brake, shafts nor other mechanisms.

Front-to-back crankshaft (heavy, forged, high carbon steel) enables fully stylelined, enclosed construction.

Multiple V-Gibs assure maximum die life.

Unusually long slide and stiff channel section eliminate deflection of guiding ways, increasing die life. (J.I.C. flanged slides available.)

Large range of throat depths accommodates tremendous variety of work.

Rugged, all-steel, box type frames stress relieved in a furnace and grit blasted before machining.

Foot switch optionally available for clutch control.

Readily equipped with pneumatic die cushions for drawing operations.

Exclusive electro-pneumatic clutch on all geared models. Famous mechanical sleeve clutch on all plain, non-geared models.

STYLELINE DEEP THROAT PRESSES

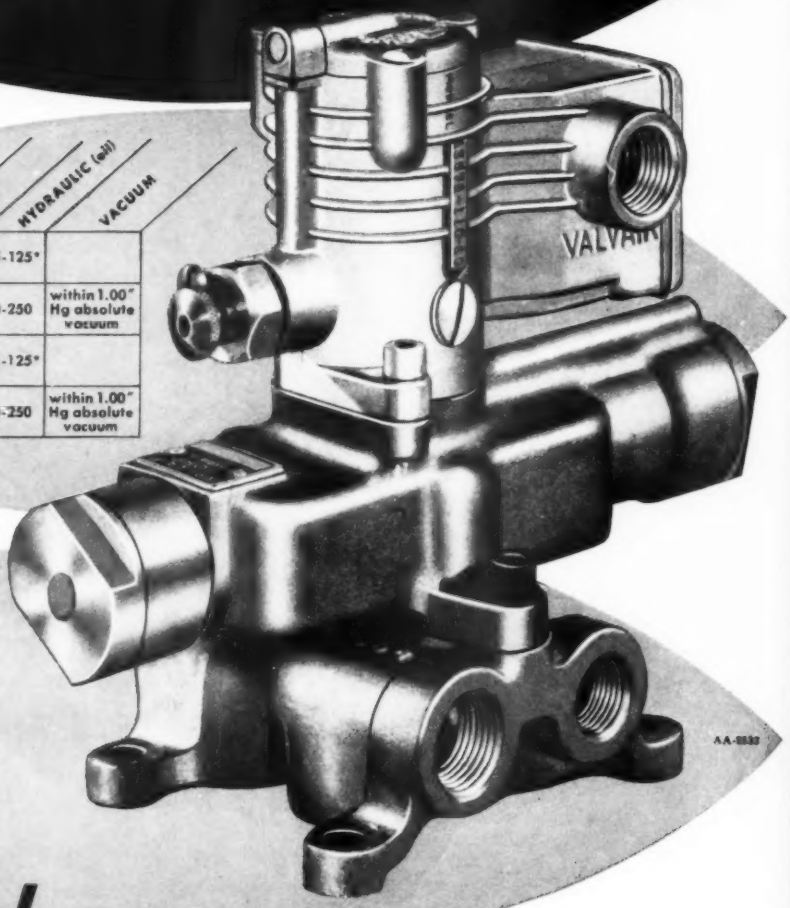
LONGER LIFE...NO COIL BURNOUT

with **SPEED KING**

The valve that likes to be compared

PRESSURE RANGES PSI	AIR	HYDRAULIC (oil)	VACUUM
Single Solenoid (internal pilot supply)	35-200	35-125*	
Single Solenoid (external pilot supply)	0-250	0-250	within 1.00" Hg absolute vacuum
Double Solenoid (internal pilot supply)	35-200	35-125*	
Double Solenoid (external pilot supply)	0-250	0-250	within 1.00" Hg absolute vacuum

Single solenoid Speed King shown. Single and double solenoid types in ¼, ⅜, ½, ¾ and 1" pipe sizes with foot or sub-base mounting. All air valves bubble-tested under water.
*Water pressure range 50-125 psi



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See us at the
ASTE Show
Chicago International Amphitheater,
MARCH 19-23
Space No. 130

Valvair

Compare the Speed King—by Valvair—with *any* valve. Check its design, features, materials of construction, and workmanship.

Be critical—check *performance*. For that's where the Speed King really scores. Up to 600 cycles per minute. And users report Speed Kings are still delivering satisfactory performance after 20 *million* cycles. What's more, Speed Kings are guaranteed against coil burnout for the life of the valve.

No matter what your requirements in air, hydraulic or vacuum control valves . . . compare and you'll specify Speed Kings—by Valvair. They perform better *longer*. Futhermore, immediate deliveries can be made from stock. Valvair Corporation, 454 Morgan Avenue, Akron 11, Ohio.

Representation in: Baltimore • Birmingham • Boston • Buffalo • Charleston, W. Va. • Chicago • Cleveland • Cranford, N. J. • Dayton • Denver • Detroit • Eureka, Calif. • Houston • Kansas City, Mo. • Logansport, Ind. • Louisville • Minneapolis • S. Pasadena • Philadelphia • Pittsburgh • Portland • St. Louis • Seattle • San Francisco • Syracuse • Montreal • Toronto • Vancouver

CIRCLE INFORM-A-GRAM KEY NO. 38

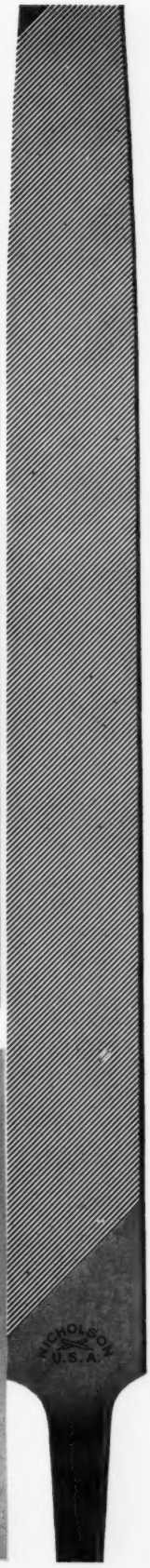
How the Nicholson Long Angle Lathe file gives you

FASTER, FINER FINISHING

You'll welcome this "specialist" in your shop because it *cuts faster and smoother and lasts longer* than ordinary files in lathe filing. It gives a fine, smooth finish to steel and many other metals such as aluminum, brass and bronze.

Correctly used, the Nicholson Long Angle Lathe file clears itself of chips that might otherwise scratch work. It should be handled with a lateral, gliding motion and gentle pressure which gradually increases through the length of the filing stroke. Spindle speed should be high. For the really satin finish of which this file is capable, the filer's touch should be extremely delicate. And he should avoid running his hand over the work, because oil and moisture interfere with the fine "bite" of the Long Angle Lathe file's precisely cut teeth.

Like all Nicholson files, each Long Angle Lathe file is carefully tested for uniformity, accuracy, and freedom from hollows that might cause scratches or grooves in the work. Made in Flat type, it is recommended for use on shafts, dowels, pins, hubs, gears—*anything* that can be set up and spun in a lathe.



There are other Nicholson and Black Diamond Special Purpose files for Brass, Lead, Aluminum, Stainless Steel, Foundry Castings, Die Castings, Die Making, Curved and Shear Tooth filing—and Swiss Pattern files in hundreds of varieties.

• • • •

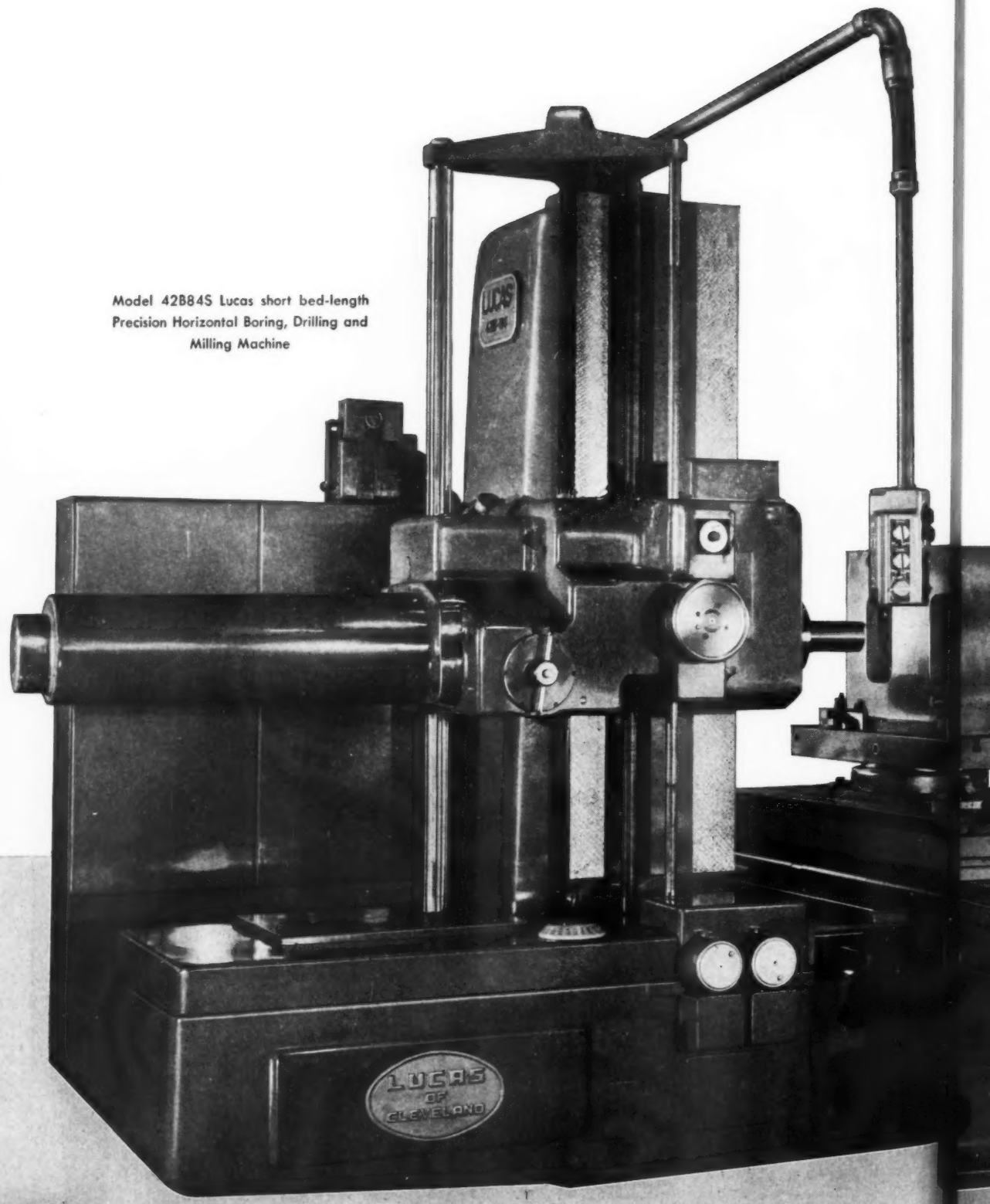
Your Industrial Distributor will gladly give you expert advice on selection and proper use of files. And he'll PROVE to you that this and other Nicholson Special Purpose files can do MORE WORK at LESS COST on YOUR job.

Write for FREE BOOK — "FILE FILOSOPHY"

NICHOLSON FILE COMPANY, Providence, R. I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES A FILE FOR EVERY PURPOSE

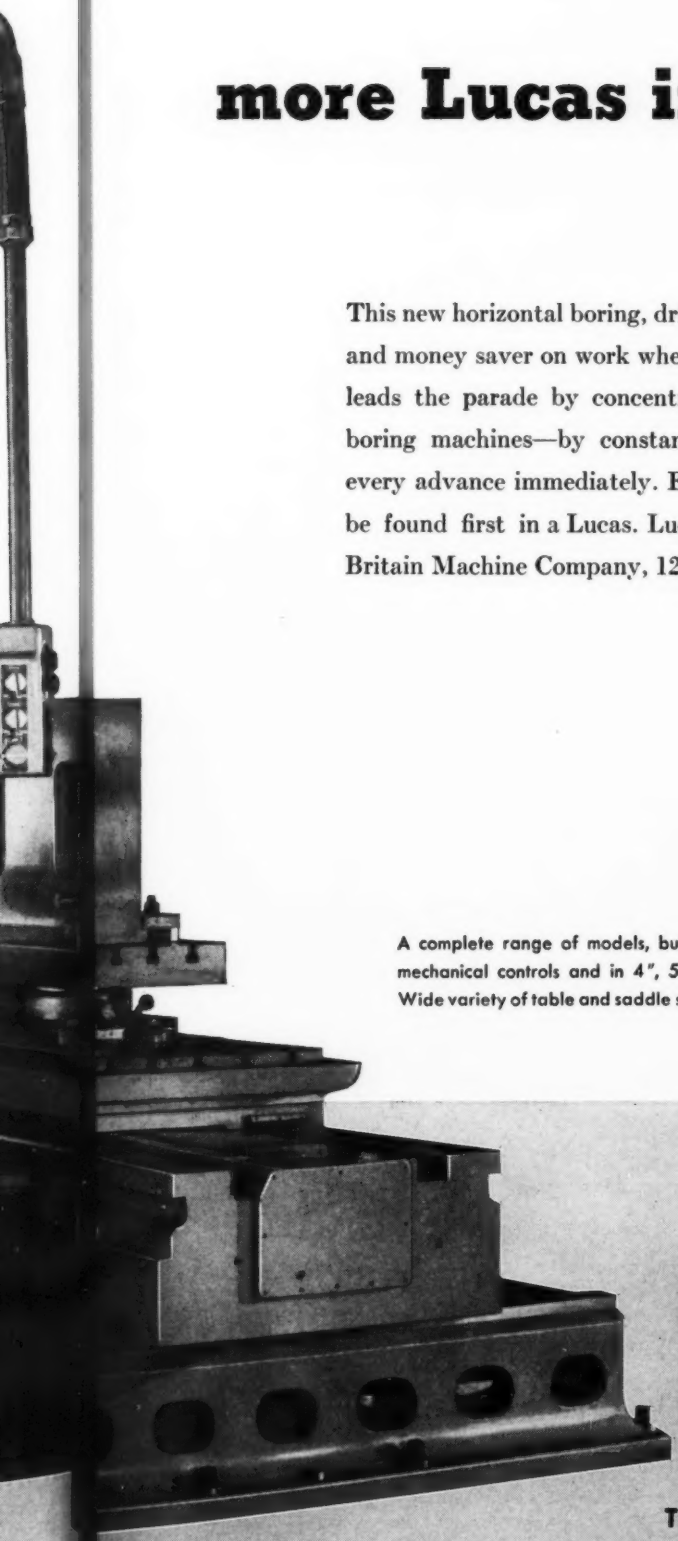
CIRCLE INFORM-A-GRAM KEY NO. 39



Model 42B84S Lucas short bed-length
Precision Horizontal Boring, Drilling and
Milling Machine

more Lucas in less space

This new horizontal boring, drilling and milling machine is a space and money saver on work where a backrest is not required. Lucas leads the parade by concentrating all its efforts on horizontal boring machines—by constant improvement, by incorporating every advance immediately. Every worthwhile improvement will be found first in a Lucas. Lucas Machine Division • The New Britain Machine Company, 12302 Kirby Ave., Cleveland 8, Ohio.

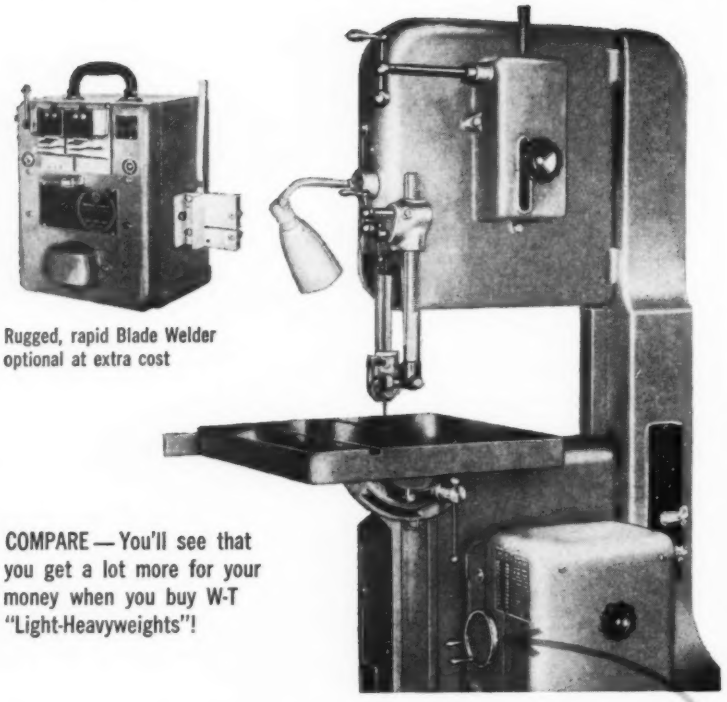


A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two- or four-way beds optional.

LUCAS
OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

WALKER-TURNER



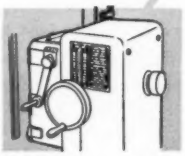
Rugged, rapid Blade Welder optional at extra cost

COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

You can vary speed from 50 sfm to 4500 sfm while this machine is running!

No time-wasting belt changes! No incorrect speeds! Turn the hand wheel, and you vary speed of this Walker-Turner "LIGHT-HEAVYWEIGHT" 16" Band Saw from 50 to 450 sfm in low range, and from 500 to 4500 sfm in high range—in stepless, smooth variation, while the machine is running.

Gives you the right speed instantly for anything that's cuttable — tough steel, non-ferrous metals, plastics, wood. Ask your Walker-Turner Distributor to show you what this precision-cutting saw will do for you. He's listed under "Tools" in your phone book's Yellow Pages. Or write today for his name, and full information.



DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT — RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS — RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS — JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-turner

WALKER-TURNER
Division
Kearney And Trecker Corporation • Plainfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 42

Will You Be There?

Jan. 9-13. Society of Automotive Engineers, Inc. Annual Meeting. The Sheraton Cadillac and Statler Hotels, Detroit, Michigan.

•

Jan. 18-20. Society of Plastics Engineers. 12th Annual Conference. Statler Hotel, Cleveland, Ohio.

•

Jan. 23-26. Plant Maintenance and Engineering Conference and Show. Convention Hall, Philadelphia, Pa.

•

Jan. 23-27. Gaillard Seminar on Industrial Standardization. American Standards Association. New York, New York.

•

Jan. 30-Feb. 3. AIEE Winter General Meeting. Hotel Statler, New York, New York.

•

Feb. 1 & 2. Midwest Welding Conference. Armour Research Foundation, Illinois Institute of Technology, Chicago, Illinois.

•

Feb. 7, 8, 9. 11th Annual SPI Reinforced Plastics Division Conference. The Society of the Plastics Industry, Inc. Hotel Chalfonte-Haddon Hall. Atlantic City, N. J.

•

Feb. 16 & 17. Conference on "Materials Handling". Purdue University's Dept. of Industrial Engineering and Indianapolis Chapter of the American Materials Handling Society. Purdue Memorial Union Building, Purdue University, Lafayette, Indiana.

•

Mar. 14-16. Spring Technical Meetings, Pressed Metal Institute. Carter Hotel, Cleveland, Ohio.

•

Mar. 19-23. 24th Annual Convention, American Society of Tool Engineers, International Amphitheatre, Chicago, Ill.

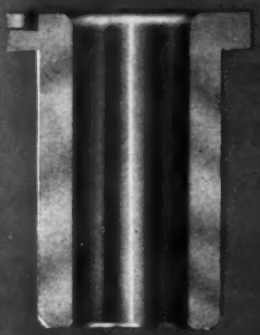
•

Mar. 19-23. American Society of Tool Engineers Industrial Exposition, International Amphitheatre, Chicago, Ill.

for accuracy in your production
it pays to specify

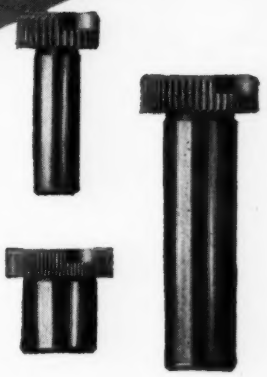
UNIVERSAL DRILL BUSHINGS

In Universal you get the best. Machined from finest quality steel. Blended radius on the top-inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



superfinish bores
lengthen tool life

The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum—especially in close tolerance work.

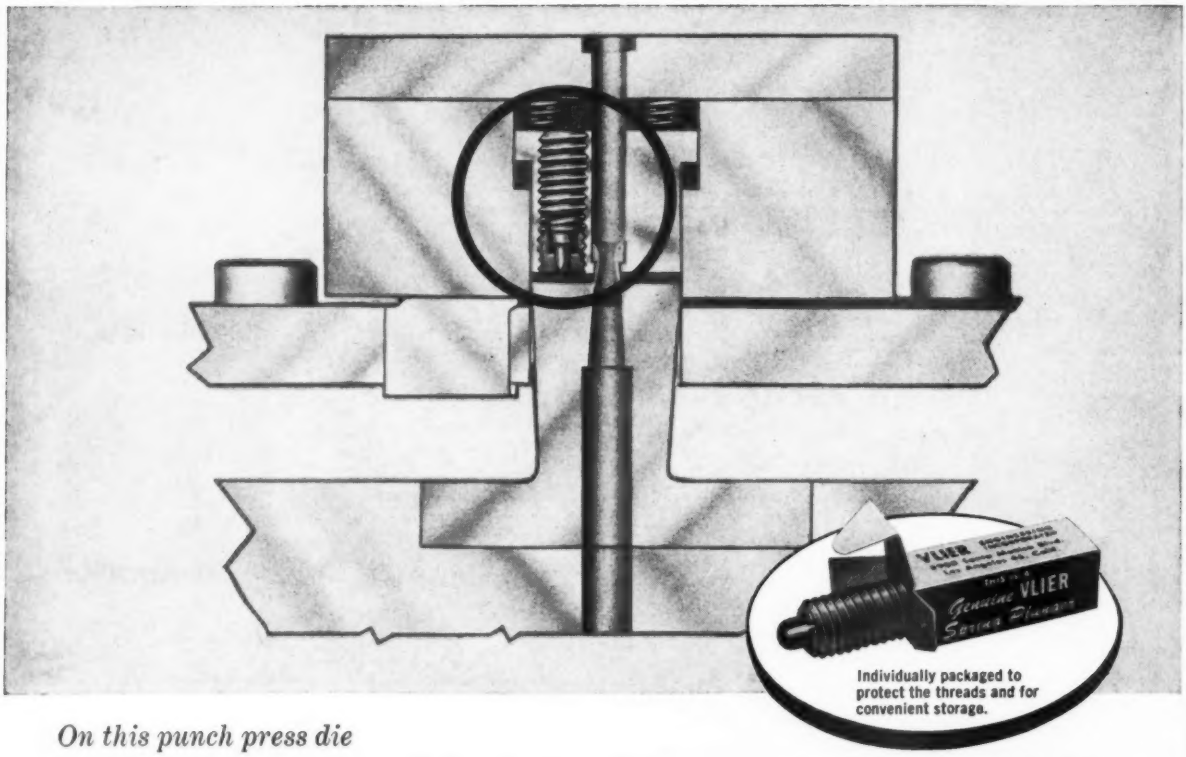


Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

Write for your copy of our new 98 page catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, Universal Index Plungers and other Universal products.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN



On this punch press die

use of a Vlier Spring Plunger saves $67.00

A typical example of how Vlier ready-made tooling accessories can save your shop hundreds of dollars every year

Formerly a "homemade" plunger device was used to break oil seals and eject parts from the punch press die shown above. Cost of resurfacing the die was unreasonably high because of time required to remove and re-install the complicated plunger device. Replacing the "homemade" assembly with a Vlier *Silvernose* Spring Plunger eliminated this lost time and, according to company tool engineers, saves $67.00 each time the die is resharpened.

As simple and quick to use as a screw

Installation and removal of Vlier Spring Plungers requires only a simple spanner-type wrench for standard nose models and an ordinary end wrench for the Hexnose type. Since only a tapped hole is required in the die, the plunger can be installed almost anywhere on the die surface. Bodies are threaded with N.C. threads, #1 fit, and rust-proofed to prevent freezing in the fixture.

Precision made

Close tolerances and large bearing surfaces between the plunger nose and the body prevent the nose from binding or wobbling, assuring perfect alignment at any extension. The nose telescopes completely within the body.

Special springs for punch press work

Springs used in *Silvernose* models were especially developed for fast, repetitive operations required in punch press work. End pressures are factory-set with the nose telescoped 50%, and are guaranteed to remain constant.

Case-hardened nose assures long life

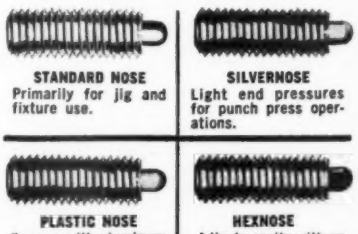
Case-hardening of the plunger nose provides maximum resistance to wear. The ductile core minimizes the hazard of fracturing under impact, common with hardened, high carbon steel.

A variety of uses

Vlier Spring Plungers are also used to position parts in jigs and fixtures, as locating pins, as detents, etc. Your Vlier distributor stocks the complete line. Call him now and order a complete assortment. They save tool maker's time and speed fabrication of jigs, fixtures and dies.

Four Nose Types Available

Wide variety of diameters and lengths.

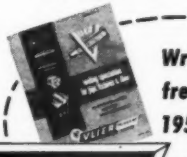


STANDARD NOSE Primarily for jig and fixture use.

SILVERNOSE Light end pressures for punch press operations.

PLASTIC NOSE For use with aluminum and brass.

HEXNOSE Adjusts easily with an ordinary end wrench



Write for your free copy of the new 1955 Vlier Catalog

Other Vlier tooling accessories

TORQUE THUMB SCREWS | SWIVEL-PAD CLAMPS | TOGGLE PADS | SPRING STOPS | FIXTURE KEYS

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 44

IT'S HERE! ... IT'S REVOLUTIONARY!

The New **Panto Marker**

Multi-Purpose Marking Machine

The one versatile unit that uses all the various marking methods:

ELECTRIC ETCH • VIBRO ETCH • ACID ETCH • ENGRAVING

• Now, there's no more need for a device designed exclusively for each particular marking method. You can do them all on this revolutionary, precision unit—a big saving for you in the purchase of only one machine to serve all requirements.

Operates on the Pantograph Principle

• A font of letters and characters is furnished from which inscriptions can be arranged, and by tracing them, the inscriptions are transferred by the pantograph arrangement to the stylus or diamond point and sharp, clear impressions are made on the object to be marked. Size range of markings 1/32 to 3/16 inches in height. Adjustable work table accommodates a maximum part up to 32 inches in height with unrestricted width. Table adjusts laterally or in a circular direction.

Add Speed, Economy, Accuracy

• The new Panto Marker is the answer! Assures uniform characters. Unrestricted capacity. Easy to operate. It's a "Must" where precision marking is required. It will save you money and time, and enable you to do a better, more accurate job.

Marks soft and hardened materials: Plastics, Fibers, practically anything.

VISIT AA GAGE BOOTH 120
ASTE 1956 INDUSTRIAL EXPOSITION

AA GAGE COMPANY
350 FAIR ST., DETROIT 20, MICH.

MAIL THIS COUPON FOR COMPLETE DATA

AA GAGE COMPANY
351 FAIR ST., DETROIT 20, MICH.

Without obligation please rush complete information on the New PANTO MARKER to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 45

Which BUSHING SHOULD YOU USE?

Your choice is getting broader every day. Each of the guide pin bushings above is good—in the right application. But, some of them cost more than others. Which should you use for best results consistent with cost?

That's where Detroit Die Set can help you. In our 25 years of exclusively building die sets, we've tested a good many types of bushings. Based upon these tests and performance in our customers' plants, we stock and recommend a number of types of bushings for use in our die sets.

To aid you in bushing selection, we've prepared a bulletin on the subject. Just ask for Bulletin 56, and we'll send your personal copy without delay. Detroit Die Set representatives also will be glad to personally aid you in selecting the right bushings and die sets. They're as near as your 'phone.

Offices in Principal Industrial Centers

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

At Your SERVICE

Eight more metal finishing firms are now franchised applicators of Unichrome 5300, a sprayable plastisol made by United Chromium division of Metal & Thermit Corp. They are: Barber-Webb Co., Los Angeles; Crane Equipment & Supply Co., Waterbury, Conn.; Kaybar, Inc., Detroit; Lithcote Corp., Norwalk, Conn., and Melrose Park, Ill.; Metal Cladding, Inc., Buffalo; Metal Weld, Inc., Philadelphia; Paterson Rubber Co., Paterson, N. J.; and Rack Processing Co., Dayton, Ohio.

Engineering Service, Inc. of America, a Detroit engineering firm, has been reestablished by J. J. Grum and K. C. Martens with the purchase of Murray Engineering Co., Detroit. The firm will provide product design and development, manufacturing cost analysis, and production engineering services.

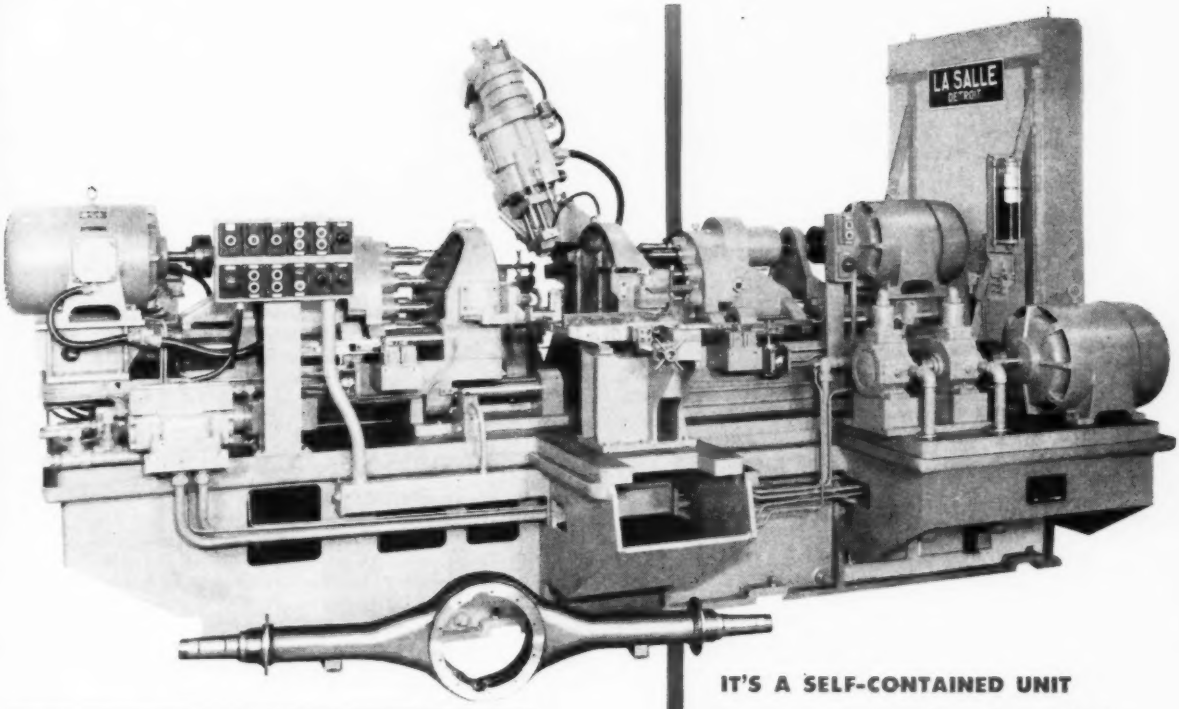
Ultrasonic testing for the presence of internal defects is the newest service available at The James H. Harron Co., Cleveland. The company will use an Ultrasonic Reflectoscope which is sensitive to small defects, even in heavy sections.

Compression, extension, torsion, and flat steel springs for almost any application are available in custom or standard sizes from California Spring Co., Inc., Los Angeles. Cal Spring's integrated high-production facilities also include tool and die making, special metal stamping, and forming, heat treating, and metal processing.

Atlantic Compound Co.'s Finishing Methods service offers guidance in finishing parts and materials. The Waterbury, Conn., firm's recommendations for those using the service include the proper buff, compound, and wheel speed to secure the type of finish required.

Continental Tooling Service, Inc., Dayton, Ohio, has facilities for product analysis, design, and tooling; tool and die, gage and fixture making; and numerous other contract services.

Olin Mathieson Chemical Corp. now sells its patterned metal used in heat and cold transfer under trade name "Olin Roll-Bond." A company process introduced in 1954 makes it possible to create any pattern of tubing within a single homogenous sheet of metal. Olin Roll-Bond may be used in any industry dealing with temperature control.



La Salle adjustomatic

processes any one of 6 different rear axle housings automatically -with no additional locaters required

IT'S A SELF-CONTAINED UNIT

It can be re-positioned anywhere without tear-down or re-assembly. Everything is built-in!

ANYONE CAN INSTALL IT

All electrical and hydraulic hook-ups have been eliminated. Merely plug in and start using.

DRILLS 21 HOLES—AUTOMATICALLY

20 holes in each housing—10 from each side, and, 1 vent hole—all drilled automatically.

ADJUSTMENTS ARE SIMPLE

There's a direct gage setting for each of the 6 housings. Set for the one you're handling.

THE VENT HOLE UNIT IS UNIQUE

It's mechanical and cam operated. Likewise, it's adjustable by direct gage setting.

IT'S BUILT TO J.I.C. STANDARDS

Meets J.I.C. Hydraulic and Electrical Standards. And, there's automatic lubrication throughout.

Written requests for information Honored Promptly.

La Salle tool, inc.

ENGINEERING & BUILDING SPECIAL MACHINERY

3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 47

MANUFACTURING MEMOS

A.F. Completes Program . . .

● The Air Force has completed its heavy forging press program and now has four units in operation at two plants. The units are located at Wyman-Gordon, N. Grafton, Mass., and Alcoa, Cleveland. All are manufacturing aircraft parts. In addition, the A.F. extrusion press program is expected to be finished in 1956.

Laboratory Use Increases . . .

● Use of scientific laboratories for research, quality and cost control, and new product development has increased more than 15 percent in the nonferrous metalworking industries during the past five years. This increase estimation was made by J. O. Bengston, president of Chicago Apparatus Co., one of the nation's leading laboratory supply houses.

Acquisitions . . .

● Borg-Warner Corp. has acquired Primor Products, Inc., Adrian, Mich. Primor Products is a contract manufacturer of refrigeration units for central air conditioning systems. The company will be operated as a Borg-Warner division and will undergo an expansion program.

● H. K. Porter Co., Inc., Pittsburgh, Pa., has taken over Henry Disston & Sons, Inc. and Carlson & Sullivan, Inc. The latter will be known as Carlson Rules and Measures, Henry Disston Div'n of Porter. The new division will be headed by Lawrence L. Garber.

● Ex-Cell-O Corp. has bought additional facilities for manufacturing operations. They include a plant in Indiana and a plant site in California.

● Kennametal Inc., Latrobe, Pa., has purchased T. R. Almond Mfg. Co., Willoughby, O. The new firm will provide additional facilities for the manufacture of Kennametal's Kendex, Kennamatic, and other mechanically-held types of metal-cutting tools.

● Blair Pin Bolt Co., Chicago and Los Angeles, has been acquired by J. D. Polis Mfg. Co. of Chicago. Manufacturing and sales will be integrated with the parent company's present facilities. Blair produces a complete line of expansion anchors and bolts.

The formation of the Ross Exchanger Div'n of American Radiator & Standard Sanitary Corp. with headquarters in Buffalo, has been announced. The new division will conduct heat exchanger operations formerly carried on by Kewanee-Ross Corp. which is being dissolved. The Kewanee Boiler Div'n will take over the steel boiler activities of the dissolved company.

◆

North American Aviation has established the Rocketdyne Div'n to carry on continued research, development, and manufacture of high powered rocket engines and related items. The new division which is an outgrowth of the company's Propulsion Center, will be headed by S. K. Hoffman.

◆

Due to the increased use of extra-thin gauges of stainless steel strip, Rodney Metals, Inc., Mass., has opened a new company in California. William Brown will supervise Rodney Metals of California, Inc.

◆

Joseph A. Anderson, general manager of AC Spark Plug Div'n, General Motors, has been awarded the Outstanding Achievement Medal of the University of Minnesota. The award goes to former students who have attained "eminence and distinction".

◆

Westinghouse electrical apparatus will be used by Kaiser Aluminum & Chemical Corp. to power its new sheet and foil rolling mill at Ravenswood, W. Va. This facility is said to be the largest capacity aluminum fabricating plant built in the U. S. since World War II.

◆

The new president of the Grinding Wheel Institute is Grant S. Diamond, president of Electro Refractories & Abrasives Corp. He succeeds Clarence E. Etheridge, Macklin Co.

◆

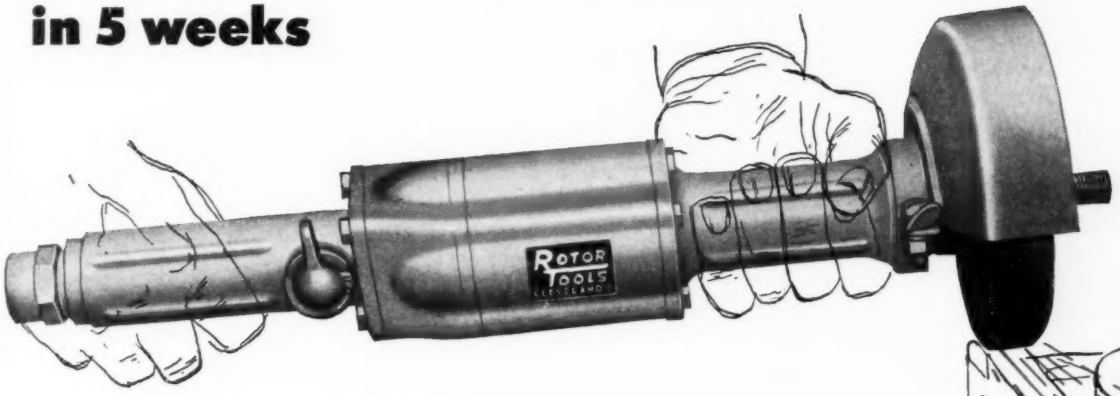
The Warner & Swasey Co., Cleveland, observed its 75th Anniversary recently by holding Open House for employees and their families.

◆

The newly acquired assets of the Brass Div'n of Detroit Brass and Malleable Co., will be used to form a new company known as Detroit Valve Co. It will be operated as a wholly owned division of Anderson Brass Co., Detroit.

DOUBLES OUTPUT

New Rotor D-6 Air Grinder pays for itself in 5 weeks



JOB: Removing flash and parting lines from steel castings. Tool used 50% of production time.

FORMERLY: Used 6″ electric grinders at 3700 rpm. Required 10 minutes per casting.

NOW: Using New Rotor D-6 Air Grinders at 6000 rpm. Job time cut to 5 minutes.

RESULTS: Output doubled. Savings paid for new Rotor Grinder in 5 weeks. Wheels last longer. Tool is 5 lbs. lighter, easier to handle.

A demonstration on *your* work will show how *you* can improve production with these new Rotor Grinders. Ask for proof.

SPECIFICATIONS FOR ROTOR D-6

RPM	WHEEL SIZE		LENGTH†	WEIGHT*
	Elastic	*Vitrified*		
6000	6″	4″	22¼	9¼
4500	8″	5″	22¼	9¼
4100	8″	5″	22¼	9¼

* For D-6S straight handle. Add ¾ lb. for D-6G grip handle.
† Deduct 1½″ for grip handle.

After 5 weeks, it's pure savings!

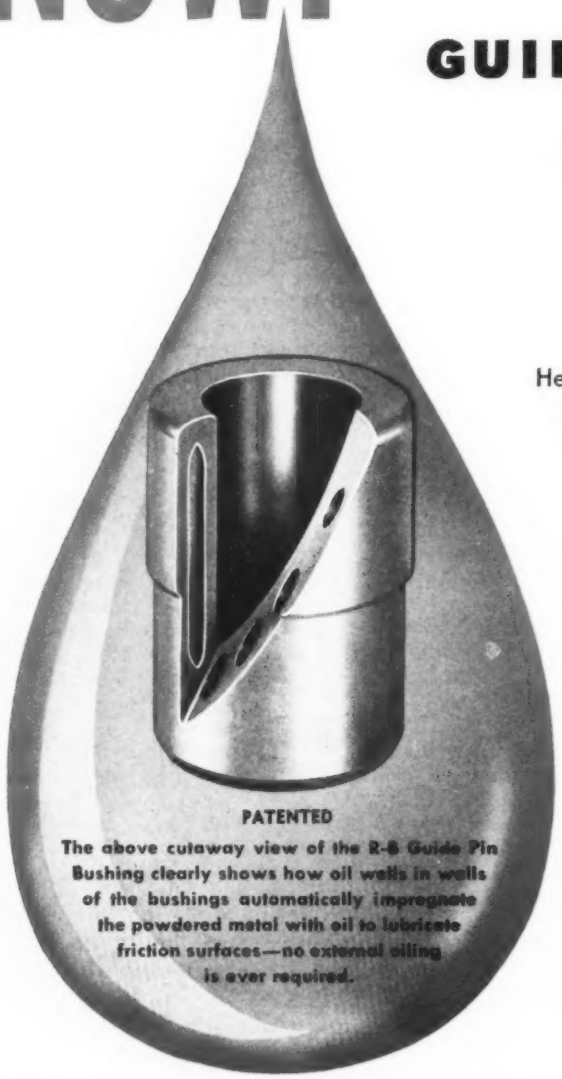
ASK FOR BULLETIN 44

THE ROTOR TOOL CO.
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

CIRCLE INFORM-A-GRAM KEY NO. 49

NOW! Self-Oiling GUIDE PIN BUSHINGS OF POWDERED ALLOY STEEL



PATENTED

The above cutaway view of the R-B Guide Pin Bushing clearly shows how oil wells in walls of the bushings automatically impregnate the powdered metal with oil to lubricate friction surfaces—no external oiling is ever required.

Here's an entirely new concept in guide pin bushings—made of heat treated powdered alloy steel, each bushing has filled internal oil wells. Lubrication to friction surfaces is automatic and no external oiling is required throughout the long life of the bushings.

Wear characteristics of these bushings are comparable to that obtained with finest bronze bushings. In addition, this new R-B design greatly reduces guide pin wear and the possibility of seizing or galling. Self-oiling, less guide pin wear and longer life add up to minimum maintenance, reduced costs and maximum usage of press time.

4117

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 79 • 12635 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

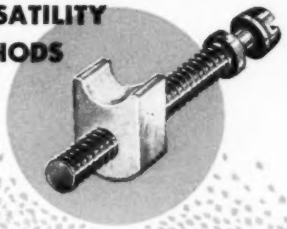
CITY _____ ZONE ____ STATE _____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 50

Bodine CASE HISTORY NO. 42

HEADLIGHT ADJUSTING SCREW ASSEMBLY SPOTLIGHTS VERSATILITY OF BODINE METHODS



This is but one of many ways in which versatile, time-tested Bodine basic machines and units can be teamed to create high-speed, cost-cutting assembly units without resort to costly "specials."

Note especially the ease and convenience with which auxiliary equipment (in this case automatic hopper feeds) can be grouped around the Bodine "chassis." Note also the high production and close limits maintained on this day-in, day-out production line job for one of the world's largest automobile manufacturers.

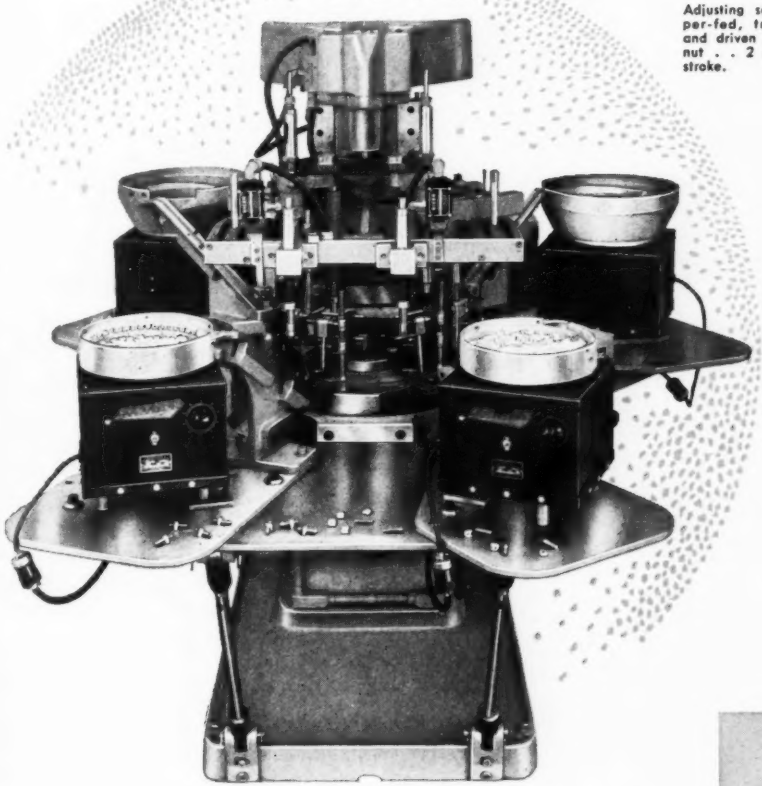
PRODUCTION: 3,000 completed assemblies per 50-minute hour. Machine speed, 30 strokes per minute.

1

Unthreaded molded nylon nut hopper-fed and transferred to the dial fixture . . . 2 pieces per stroke.

2

Adjusting screws hopper-fed, transferred and driven into nylon nut . . 2 pieces per stroke.



3

Auto eject completed assembly. Depth of screw driving held consistently within ½ turn in untapped nut.

If high-speed, low-cost assembly is one of your problems . . . in metals, plastics, or a combination of both . . . with or without concurrent machine operations . . . check first with Bodine. The possibilities of our methods are practically unlimited.

Write Dept. TP-1

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

8BD55

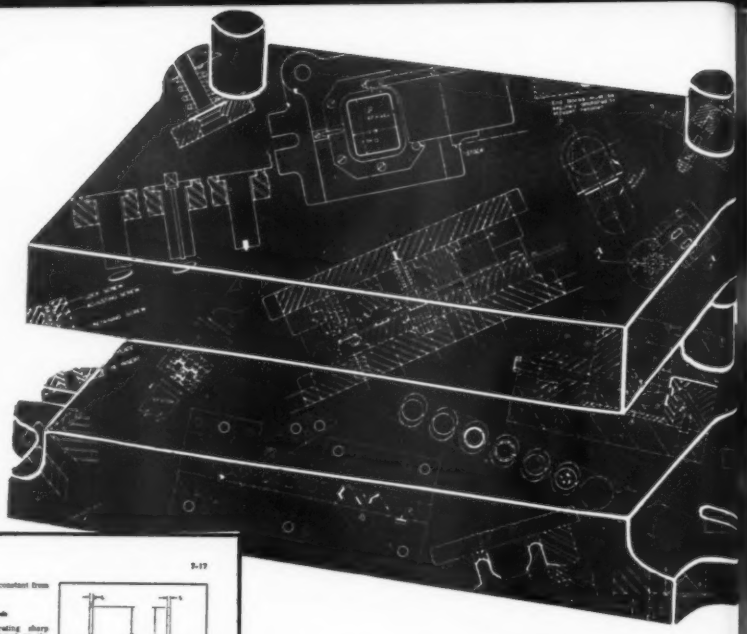
CIRCLE INFORM-A-GRAM KEY NO. 51

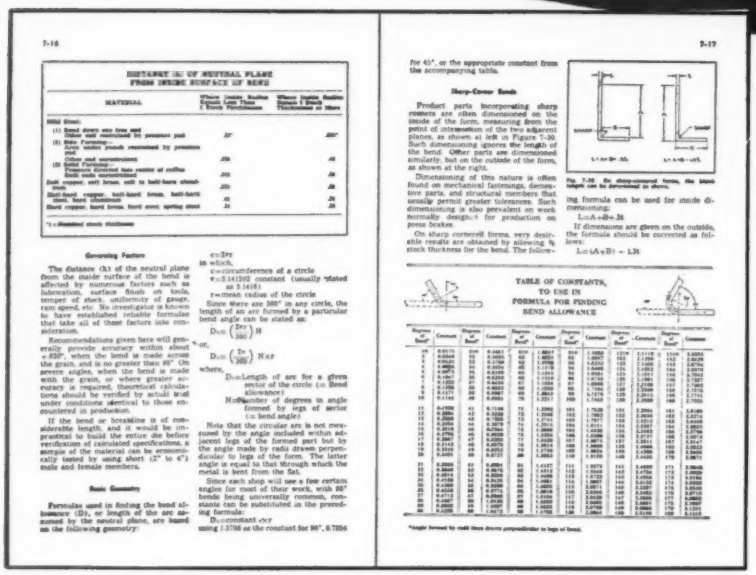
DIE DESIGNING AND ESTIMATING

Fourth Edition

Now Ready!

Copies shipped immediately on receipt of your order.





368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

Valuable to the die designer, engineer and die maker as a reference and refresher, and to the student and apprentice in classroom and on-the-job training.

A few of the major subjects covered:

Economical Use of Strip Stock
Step-by-Step Design of the Basic Dies
Short-Run, Lamination and Progressive Dies
Detailed Descriptions of Many Successful Dies
Effective Use of Inclinable Presses
Factors Affecting Perforator Life and Failure
Deep-Drawing Techniques
Blank Development
Time-Unit Values for Estimating Die Costs
Determining Required Press Capacity

Price, $7.50* per copy. Copies will be shipped immediately on receipt of your order.

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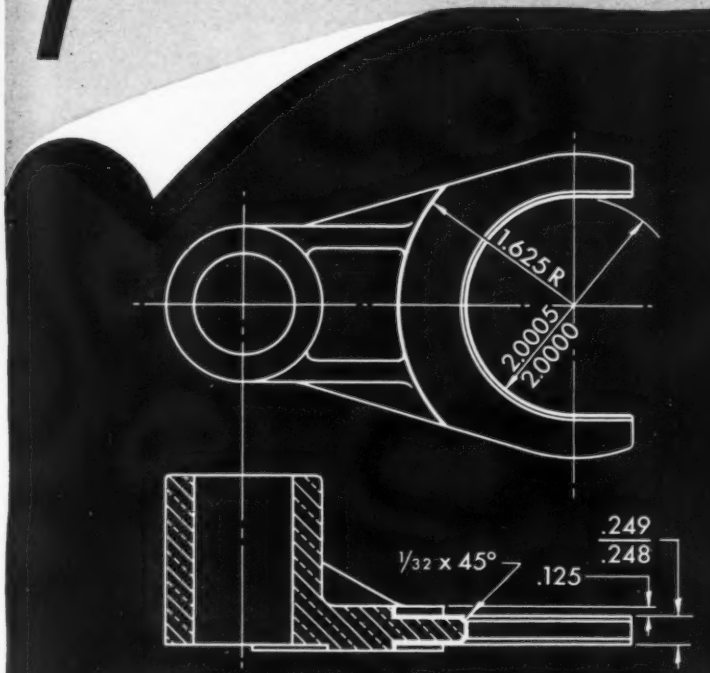
Open account shipments on purchase orders of rated companies. Otherwise, check must accompany order. No C.O.D.'s, please.

*Ohio customers add 3% sales tax.

7 SURFACES on SHIFTER FORK MACHINED AT 1 PASS!



And held to precise limits by using MICROBORE® Precision Tooling-

Illustration shows setup for completely machining shifter forks on standard Vertical Milling Machine to precise limits of accuracy on a production basis. This application of Microbore Cluster Tooling permits use of simple low-cost work holding fixture, and substantially reduces tool costs per piece.

Write for Illustrated Catalog . . .

Microbore®
PRECISION TOOLING

DEVLIEG MICROBORE CO.
2720 West Fourteen Mile Rd. • Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 53

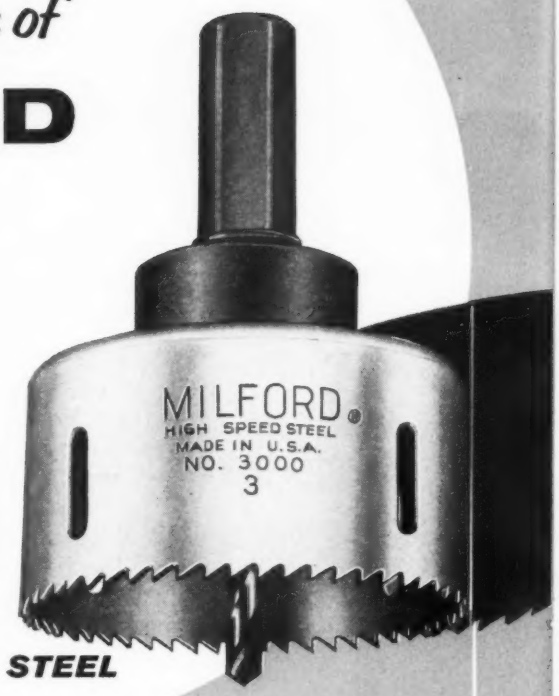
New!

A Complete Line of

MILFORD HOLE SAWS

SHATTERPROOF

CUT CLEAN, ROUND HOLES IN PRACTICALLY ANY MACHINABLE METAL OR OTHER MATERIAL



HIGH SPEED STEEL

WIDE DIAMETER RANGE — 9/16" TO 6"

WELDED EDGE BLADE CONSTRUCTION

. . . using the finest high speed steels, provides unusually hard, sharp, fast-cutting, long-wearing teeth combined with a tough, resilient back. The result is a shatterproof blade that takes the roughest use in stride.

A COMPLETE SELECTION OF ARBORS

. . . including "follow thru" type. All include high speed steel pilot drill and are equipped with drive pins for the larger diameter saws. Also available are arbor adapters allowing use of hole saw arbors in Morse taper sockets.

MILFORD

THE HENRY G. THOMPSON & SON CO.

Saw Blade Specialists for Over 75 Years

NEW HAVEN 5, CONNECTICUT

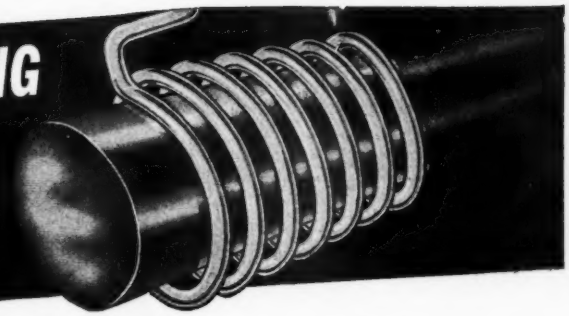
Profile Blades and Band Saw Blades
Hand and Power Hack Saw Blades

BUY FROM YOUR MILFORD DISTRIBUTOR
a Local Businessman, and:

Save Time . . . *through local availability*
Cut Buying Costs . . . *one source of supply*
Reduce Inventory . . . *he carries a stock*

CIRCLE INFORM-A-GRAM KEY NO. 54

YOU CAN HEAT ANYTHING
FROM A NEEDLE . . . TO
A TURBINE SHAFT
FASTER and BETTER



BRAZING
Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING
Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING
Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING
Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

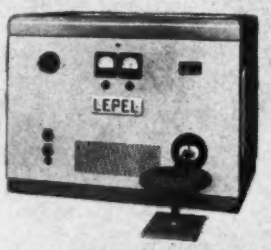
MELTING
Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

WITH Lepel

HIGH FREQUENCY
Induction
HEATING UNITS

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.



2½ KW INDUCTION HEATING UNIT

30 KW INDUCTION HEATING UNIT

100 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2½ KW; 5 KW; 10 KW; 20 KW;
30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

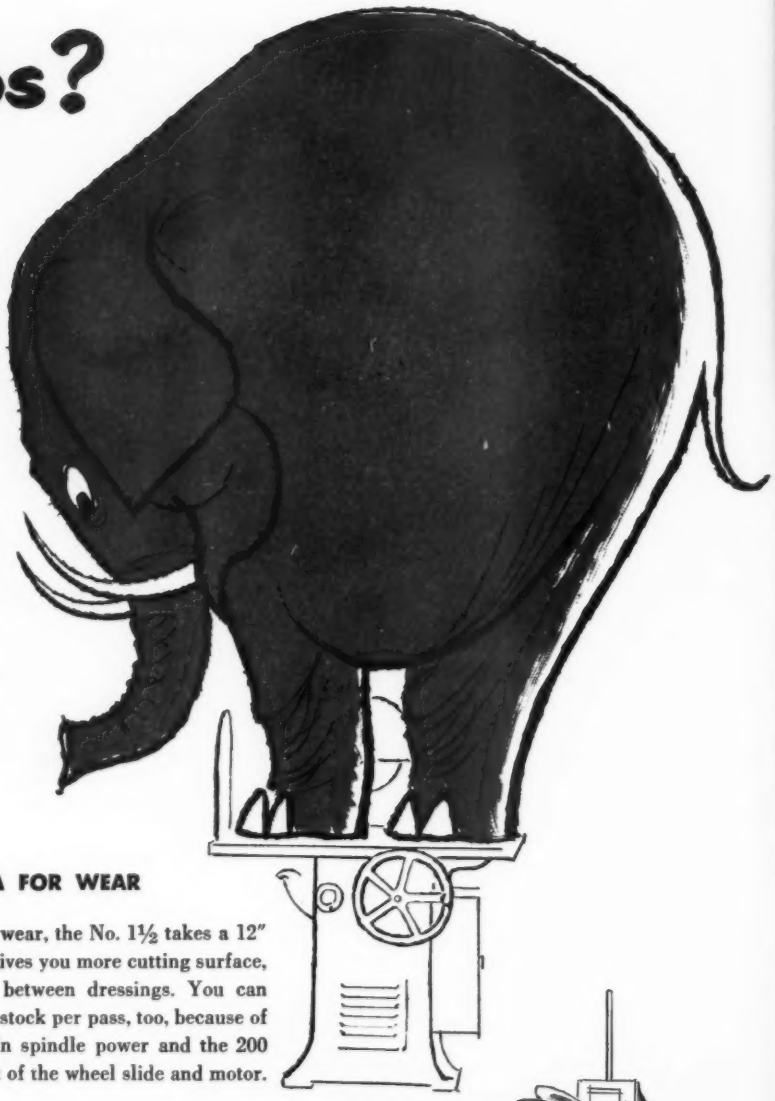
WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 55

Jumbo Jobs?

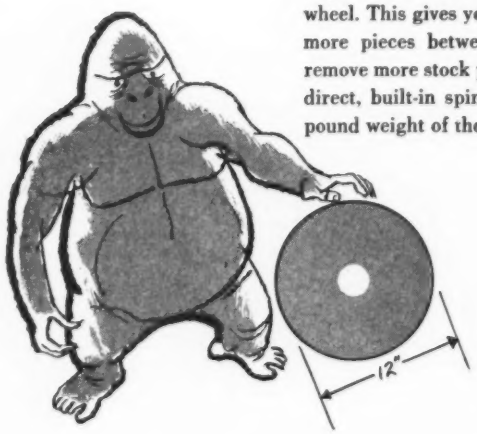
Sure . . . on an ABRASIVE No. 1½

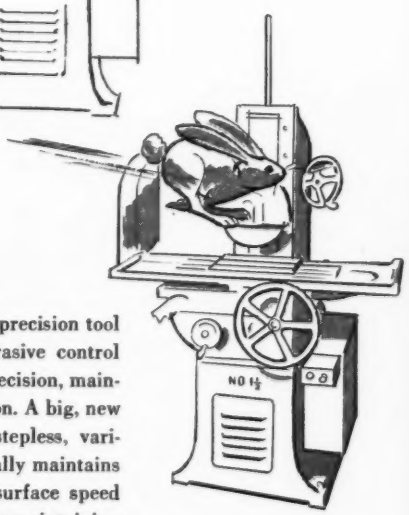


Because the Abrasive 1½ table has a 10" x 15" chuck with a full 150 square inches of surface area. A big handfeed grinder designed to do more, more easily, the 1½ gives you a full 12" capacity under the wheel. A lot of grinder for the money.

A GORILLA FOR WEAR

A gorilla for wear, the No. 1½ takes a 12" wheel. This gives you more cutting surface, more pieces between dressings. You can remove more stock per pass, too, because of direct, built-in spindle power and the 200 pound weight of the wheel slide and motor.





FAST AS A RABBIT

Fast as a rabbit, the No. 1½ precision tool room grinder with Electrabrasive control saves you time, gives more precision, maintains finish and eases operation. A big, new feature, the Electrabrasive stepless, variable-speed spindle electronically maintains a constant 5500 peripheral surface speed from a 12" to a 6" wheel, while maintaining effective torque. To operate all you do is set the knob on the wheel head!

A two-cent post card will bring you this whole story on the BIGGEST little grinder on the market.

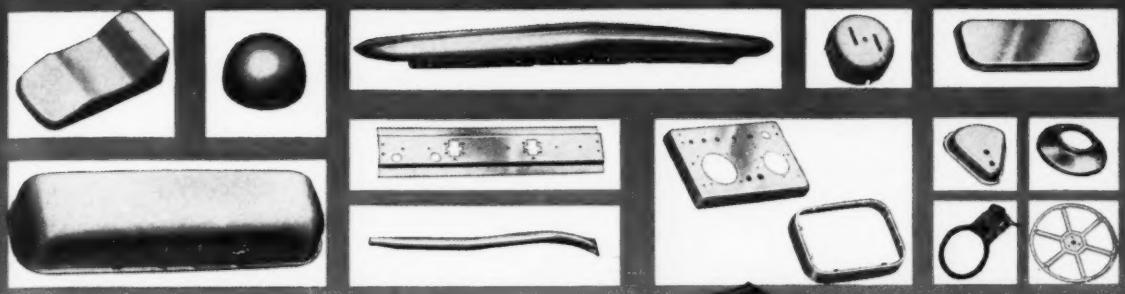
ABRASIVE
Machine Tool Company
East Providence 14, R. I.

For Forty Years
First For Accuracy — Economy

ABRASIVE
ACCURACY POWER PRODUCTION

CIRCLE INFORM-A-GRAM KEY NO. 56

if you use or sell parts like these...

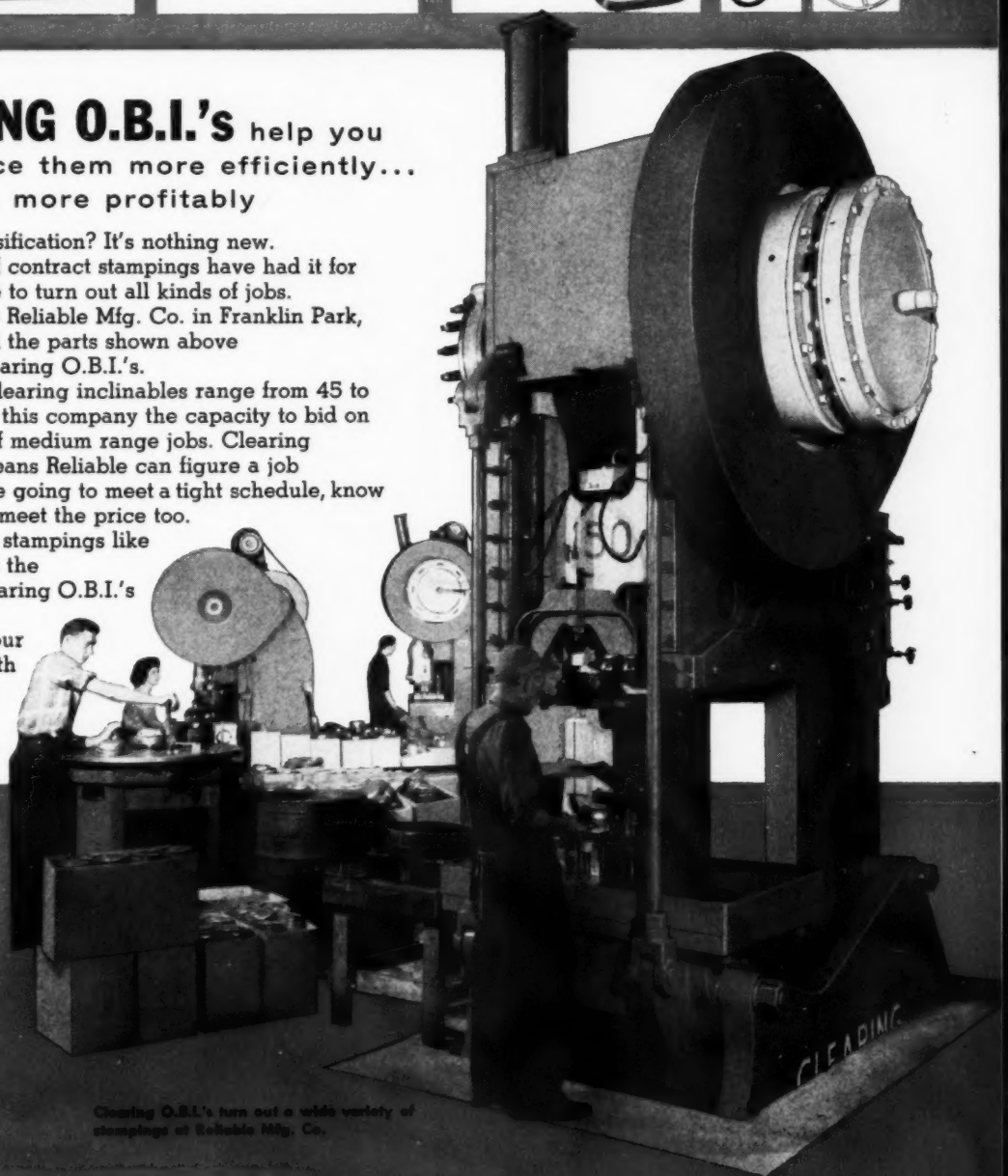


CLEARING O.B.I.'s help you produce them more efficiently... sell them more profitably

Talk about diversification? It's nothing new. Manufacturers of contract stampings have had it for years. They have to turn out all kinds of jobs. For example, the Reliable Mfg. Co. in Franklin Park, Illinois produced the parts shown above on their four Clearing O.B.I.'s.

Reliable's Clearing inclinables range from 45 to 150 tons, giving this company the capacity to bid on a great variety of medium range jobs. Clearing dependability means Reliable can figure a job and know they're going to meet a tight schedule, know they're going to meet the price too.

If you make stampings like these, you'll find the efficiency of Clearing O.B.I.'s pays off in the clinches. Talk your problem over with a Clearing sales engineer. Call us today.



Clearing O.B.I.'s turn out a wide variety of stampings at Reliable Mfg. Co.

Write for new Clearing booklet—"Thinking about a better way to do the job."

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *division of U. S. INDUSTRIES, INC.*

6499 West 65th Street, Chicago 38, Illinois • Hamilton Plant, Hamilton, Ohio

Don't Waste Hours ADJUSTING AND SETTING CONVENTIONAL DIES

when the "WALES-WAY" takes ONLY MINUTES!

A WALES TOOL

TAKES MINUTES TO SET

AND ELIMINATES HOURS OF

- set-up time
- press down time
- setting stripping guides
- counter-boring for springs
- setting heavy stripper plates
- die buttons, etc. etc.

WALES MOBILE TRUCK UNITS

We have a well-equipped Motor Truck . . . a shop on wheels . . . that will demonstrate "WALES-WAY" methods right at your door. We will gladly arrange to have you see and use this demonstration. Please let us know a suitable time.

A Typical Foreman says:

"That's the way it's been around this shop for years. Still would be if the boss hadn't heard about WALES Hole Punching UNITS. What a deal.

"Instead of building a new die for each pattern, setting it in, lining it up and constantly checking to make sure punch and guide register, instead of watching every down stroke of the press ram, watching the special punch plates, stripper plates, die buttons and all the rest of time cosuming detail . . .

". . . we do it the "WALES-WAY" *now*. We set up a group of these self contained, individual WALES UNITS, one group for each pattern. We do it *fast*; so fast that our first run is on the punch press the same day. We can set up in minutes, change in minutes, shove work through faster than ever before because of the automatic guide principle that keeps the run accurate to the hair line from first to last ram press stroke."

WALES UNITS may be used over and over again. No dead storage. No enormous files of dies, plates etc. to be combed over for a re-run. This wonderfully flexible method requires a minimum of equipment at a minimum of cost. Saves hours and hours in your shop. Makes plenty of additional profit on every run.

No die-set needed, no pressure pads, no stripper plates with WALES UNITS. Punches, stripping guides, springs and guide buttons are all component parts of the UNITS not attached to the press ram. WALES UNITS ha a shut height of 5½" so only one adjustment of t ram is needed.

WALES ENGINEERING SERVICE • Our Engineers will su your shop, your work, your methods if you wish, entirely out obligation. You'll receive valuable information and sug tions for time saving and EXTRA PROFITS.

Send for
BULLETIN NO. 11

This folder contains much information that should interest you. Pictures and data to help you judge the merits of "the WALES-WAY"

WALES Strippit CORPORATION
"...the Wales-Way is the PLUS-PROFIT way"
345 PAYNE AVE. — North Tonawanda, N.Y.
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

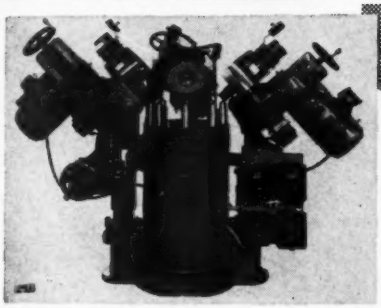
ACME *Automatics* DELIVER

HIGH OUTPUT AT LOW COST ON PRODUCTION FINISHING

ACME *Semi-Automatics*

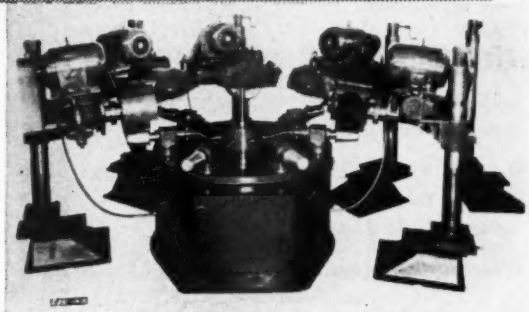
Acme Semi-Automatic Polishing and Buffing Machines are available in a wide range of types and spindle arrangements.
LEFT—Acme Type B-10, single spindle.
RIGHT—Acme Type L4, four spindle, an automatic indexing machine.
Acme "Semi's" meet production and finish demands on a great variety of parts. Their efficiency and dependability has been fully demonstrated in industry.

CATALOG ON REQUEST



ACME *Rotary Automatics*

Acme Rotary Automatics are furnished with Indexing and Continuous table operation. They are available with table sizes from 18 inches to 24 feet diameter and are outstanding production machines.

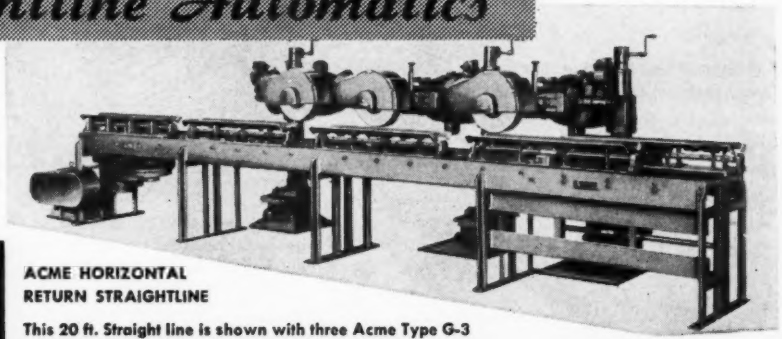


ABOVE—Acme Type L-8-L Rotary with variable speed control with less than one second index interval. Unusually efficient for finishing small parts.
RIGHT—Acme 66 inch, 7 station indexing rotary with right angle attachment illustrating one of many efficient Acme arrangements of these versatile units.

CATALOG ON REQUEST

ACME *Straightline Automatics*

Acme Straightline Automatics standardize polishing and buffing operations at high production levels at low unit costs. Available in horizontal return over and under, loose fixture and other types and from 20 to 80 feet in length. Many effective arrangements to meet specific requirements.



ACME HORIZONTAL RETURN STRAIGHTLINE

This 20 ft. Straight line is shown with three Acme Type G-3 adjustable floating head polishing and buffing lathes. It can be increased in length to 80 ft. by adding standard 10 ft. sections.

CATALOG ON REQUEST

RECOMMENDATIONS AND QUOTATIONS

Please send blue prints or finished and unfinished samples of part to be finished with detailed information on present finishing operation and production requirements. Recommendations and quotations will be furnished.

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

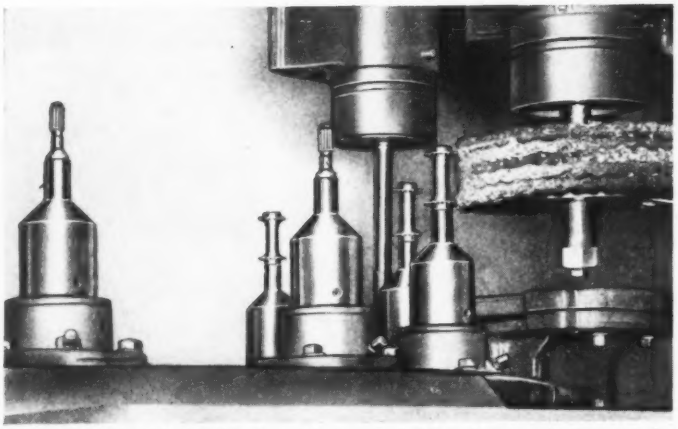
ACME *Manufacturing Co.*

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

CIRCLE INFORM-A-GRAM KEY NO. 59

Self-release, greater grip, automatic alignment of ERICKSON MANDRELS speed small to large part loading



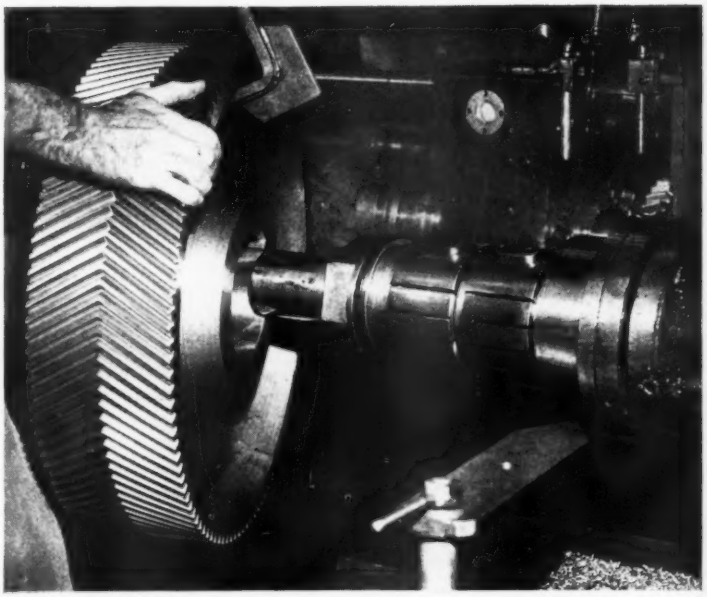
SMALL ERICKSON MANDRELS play a big part in holding down production costs for leading bicycle parts manufacturer. Here you can see how Erickson drawbar-operated, precision expanding mandrels speed wheel hub loading for buffing operation. Ease of operation and instantaneous release have greatly speeded this quantity production holding problem.

Regardless of size, Erickson precision expanding mandrels operate on Erickson's famous double-angle principle that not only assures guaranteed accuracy of .0005" T I R, but also makes mandrels self-releasing. They are available for air, hydraulic or manual operation. Special mandrel sleeves are designed to match various internal forms. AA-72

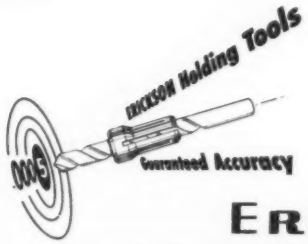
ERICKSON MANDREL ADVANTAGES

- Instantaneous self-release greatly speeds loading and unloading
- Greater holding power because grip extends over entire sleeve length . . . stops wobble and chatter
- Guaranteed accuracy of .0005" T I R
- Each sleeve covers a range of 1/32"
- Sleeves are interchangeable on mandrels of same series

Are you bothered by a tough internal holding problem? Then let us prove that Erickson mandrels speed production for lower unit costs. Give us a call today or write for catalog K.



ERICKSON MANDRELS speed large part handling, too. See how easily this heavy shovel gear, 24 inches in diameter, is being loaded for gear cutting at the Alten Foundry and Machine Works, Inc., Lancaster, Ohio. Larger shovel gears up to 61 inches in diameter are handled just as easily. At Alten Foundry, using an Erickson mandrel, loading and automatic alignment require only 10 percent of the time required by plants using solid arbors and arbor presses. Even this large mandrel is self-releasing. Operator fatique is practically eliminated.



ERICKSON TOOL COMPANY

2301-1 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 60

atoms are not everything

This week we have explored the material wonders of the atomic age as disclosed during Cleveland's Nuclear Engineering and Science Congress and International Atomic Exposition. We came from the lectures and demonstrations with a considerable mixture of emotions.

Not the least of them was a bit of ego in behalf of this country's scientific and engineering brainpower: How smart can we be? There's seemingly no limit to our ingenuity, what can stop us? Can we not accomplish anything we set our man-trained minds to? Are we not demonstrating our superiority over nature by our conquest and utilization of forces heretofore unknown to us?

Haven't we reached the point where we have only to suspect the existence of an unknown force in order to go to work on it and come up with more and greater material accomplishments?

Maybe, however, things aren't just that simple.

This morning's mail brought our regular copy of "The Navy Technical News" with contents emanating as usual from the Bureau of Aeronautics, Office of Naval Research, and the Bureau of Supplies and Accounts. The first page, however, carried the following Christmas message to their readers. We are privileged to pass this on to you:

> "Today Americans are conversant with technical subjects that run gamut from radioactive fallout to artificial satellites. There seems to be no limit to the wonders man can create. And these present day accomplishments will soon be dwarfed by those that follow.
>
> "But let us not forget that man, the individual being, was himself created by a supremely competent architect, and therefore all these technical advances are due to Him. Created in the image of God, man was given the power to create from the wonders of nature which are his heritage. But how much he still has to learn from the Master! We recognize man as the most complicated machine. Yet even if we could duplicate the physical organs we could still not create human life because of the intangible entity which makes him human, his soul. This is something which is easy to observe but can never be capsuled.
>
> "Into this soul was brought a Goodness, sent from the Architect to lead men to strive for the ideals of truth, honesty, and concern for others. At this time of Christmas let us never forget Who gave man his heritage. Let us work for His glory and in the spirit of peace on earth, good will toward men.
>
> Chaplains' Division"

It is our hope that the Navy Chaplains' message may help you contemplate some of the wonders and problems posed by atomic energy as it has us.

December 16, 1955

E. Willard Pennington

editor

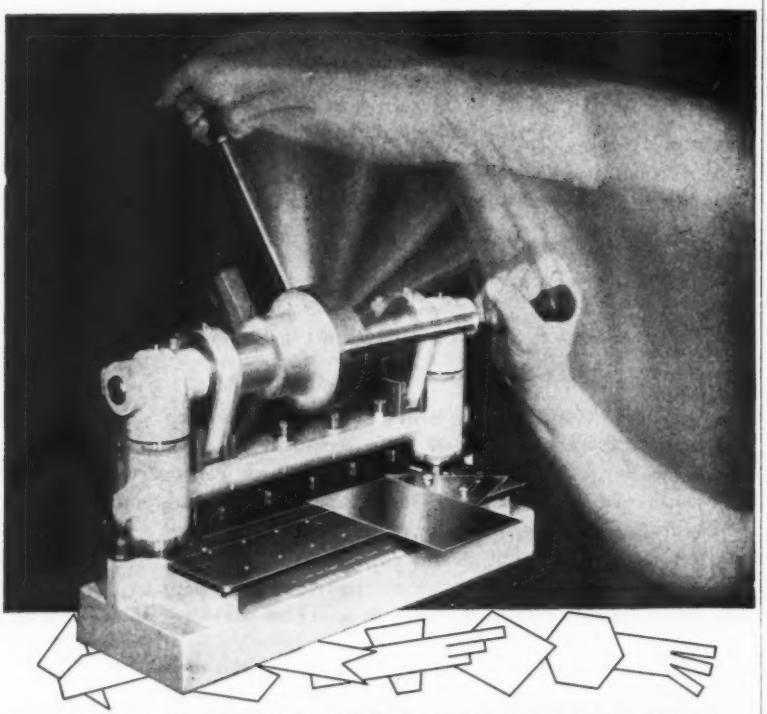
Editorial Index

DEPARTMENTS

PUBLICATION PREVIEWS 124
Capsule description of current literature. Bulletins, brochures, catalogues and circulars — You name it.

SHOP AIDS 158
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PROGRESS ON PARADE 162
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.



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CIRCLE INFORM-A-GRAM KEY NO. 62

EDITORIAL: atoms are not everything 61

— FEATURES —

PLASTIC MOLDS. "Building Heated Plastic Molds" by Leo J. Contanza, Douglas Aircraft Co., Inc. 10

A series of investigations into the feasibility of electrically heat-curing molds made of aluminum filled epoxy resins have been conducted at Douglas. Procedures and results are discussed by the author.

WORK-HARDENING STEELS. "Machining Work-Hardened Alloy Steels" by W. M. Halliday 64

Numerous useful means are described whereby the machinist and set-up man can minimize the tendency toward work-hardening of stainless and alloy steels while performing machining operations.

GAGE BLOCKS. "Measuring to Millionths with Chrome Carbide" ... 67

Chrome carbide gage blocks have opened up an entirely new concept of accuracy and interchangeability. A discussion of their outstanding qualities is presented.

AUTOMATION. "How to Automate Your Plant" by Charles F. Hautau, Hautau Engineering Co. 69

If you are going to automate your plant, what will be your approach to the problem? Mr. Hautau outlines three methods of procedure in which he points out what advantages can be expected from each.

INSPECTION. "The Precision Measurement of Cylindrical Bores" by J. C. Cherna, McGill University, and B. Goode, Alina Corp. 73

The more common geometric errors that occur in ostensibly circular cross sections are analyzed as to how they may be best detected and measured.

AUTOMATION. "A New Concept in Press Automation" by Watson N. Nordquist, Managing Editor 77

Continuous cycling of a press line is made possible by introduction of a new lift-and-carry type transfer unit of unique design and versatility.

Editorial Index

DIE SETS. "How to Cut Costs on Special Steel Die Sets" by Phil Marsilius, The Producto Machine Co. . . 94

Cutting die set costs and shortening delivery time are possible by following the nine recommendations set forth by Mr. Marsilius.

WELDING. "Safe Practices in Welding" by W. Schweisheimer, M.D. 154

Health hazards in welding are relatively few but if proper safety rules are applied and protective equipment is used, these hazards can be guarded against. Dr. Schweisheimer points out these hazards and suggests treatment in case of accident.

— SHORTS —

Cooler Resinoid Grinding Wheels . 16
At Your Service 46
Numerical Control of Precision Milling 76
Carbide-Faced Valve Lifters in Mack Engines 102
Versatile Dial Indicator Used to Gage Set Parts 102
How to Get the Best Results From Cut Off Machines 104
Improved Cutting with Carborundum's New Ceramic Tools . . . 106
Twisted Slide Rails Facilitate Part Orientation 107
Automated Facing Machine Built From Stock Drill Heads 110
Printed Circuits Manufactured by Cleveland Firm 112
Films to See 112
Automatic Machine Feeds Stampings into Trim Die 114
Nominate Now for Redesign Award 116
Forming Automatic Transmission Brake Bands 120
New Press Control Stops Press & Die Damage 122
Advantages of Silver Alloy Brazing Preforms 136
Expanding Mandrel Simplifies Gear Production 138
Swiss Paper Analyzes Casting Differences 139
Shot Peening Improves Material Fatigue Strength 142
Die Cast Auto Engine Blocks Now a Reality 144
New Carbide Uses to Be Covered at Carboloy Courses 145
Industrial T V Operated by Remote Control 145
The Ultrasonic Barrier Broken by New Power Generator 157
New Gun Driller Can Eliminate Up to 6 Tools 161
J. D. White Named President of Darwin-Milner 161
Necrology 161

DEPARTMENTS

COMMENDABLE COMMENTS 28
WILL YOU BE THERE? 42
MANUFACTURING MEMOS 48
MEN YOU SHOULD KNOW 140
CALLING CARDS 147
GROWING PAINS 148
WHAT'S NEW IN PLASTICS 152

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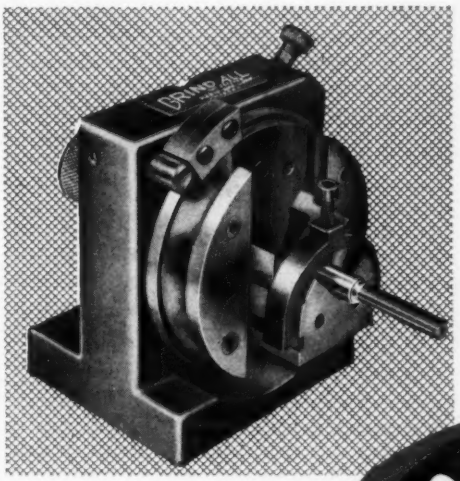

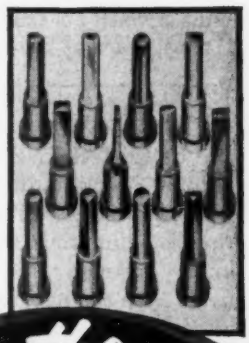

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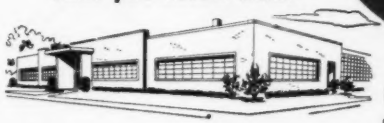

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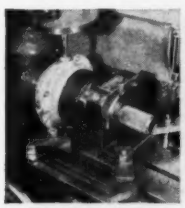

BORING FIXTURE

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CIRCLE INFORM-A-GRAM KEY NO. 63

Machining Work-Hardened Alloy Steels

The inimical work-hardening effects arising from the machining and working of the austenitic steels are a well-known and often troublesome phenomenon.

This article describes numerous useful means whereby the machinist can minimize the tendency towards work-hardening. It particularly deals with the practical measures to be followed in the machine shop for correcting the condition during the machining of stainless steel parts so that their completion may be simplified and facilitated.

by W. M. Halliday
Southport, England

A workpiece such as this stainless nickel alloy cylinder represents a considerable investment in material and machining hours. In his article, Mr. Halliday details the meticulous attention that must be devoted to machine rigidity, tool geometry, and speeds and feeds, in order to overcome the tendencies of such material to work-harden in localized spots.

MUCH VALUABLE INFORMATION concerning work-hardening of certain stainless and alloy steels have appeared from time to time in numerous technical journals. In the main, however, such published works have dealt with the nature and physical mechanism of work-hardening; how it develops with various alloy steels and different forms of working; its extent and effects; and the metallurgical or chemical means available to the steel manufacturer to reduce or avoid the tendency.

All these aspects have certainly been well investigated and the results are of great value to the metallurgist and steel maker. On the other hand, little attention has so far been devoted to the equally important yet more severely practical aspect, i.e., that of the ways and means available to the machinist for remedying, most effectively and inexpensively, work-hardening effects which have developed during the actual machining of stainless or alloy steel.

This problem of correction of work-hardened parts while still in production with the minimum of trouble, delay, and cost, constantly recurs and many machinists and tool-setters will be acutely conscious of the lack of reliable data embracing technical guidance. This is especially the case with the machining of stainless steel rod and bar stock in the conventional automatic screw machine. The onset of this condition with such machines is a frequent source of tooling, set-up, and operating difficulties; resulting in much wastage of time, material, and tools, as well as repeated and prolonged machine down-time.

Some Common Causes of Work-Hardening

Many causes may operate, singly or in combination, to produce work-hardening of stainless or alloy steel parts during machining. Some of these may be mentioned now to remind machinists, and tool-setters in particular, of the several ways, often comparatively simple and most easily overlooked, by which the condition may develop. These are:

1. Blunt Cutting Tools In the operation of automatic lathes, and drilling and boring machines, single point cutters, twist drills, parting tools and a variety of form tools having unduly long and only weakly supported cutting edges are regularly used for stock removal. These particular styles of cutting tool lead to the most frequent development of work-hardening.

This is due to the relatively severe loading imposed on such tools when cutting tough stainless and other alloy steels. The load is usually highly concentrated at some strictly

Accompanying photos courtesy Westinghouse Electric Corporation.

localized spot on the cutting edge which is often the weakest point in the entire tool structure. The heavy localized loading, coupled with the absence of other suitable working conditions, may speedily break down the critical cutting edge, to cause grave aggravation of work-hardening.

When such tools become dull, tremendous heat is generated on both work and cutter because of the excessive friction arising from the rubbing (instead of cutting) action occurring between the two. The metal is torn or abraded instead of being cut cleanly.

The additional feed pressures required by such a dull tool may result in the tool being inadvertently shifted from its original setting, so that rubbing, binding and overheating become still further aggravated. Persistent application of a blunt tool may lead to serious snipping, galling or even complete fracture of the critical cutting edge, whereupon work-hardening troubles will be greatly increased.

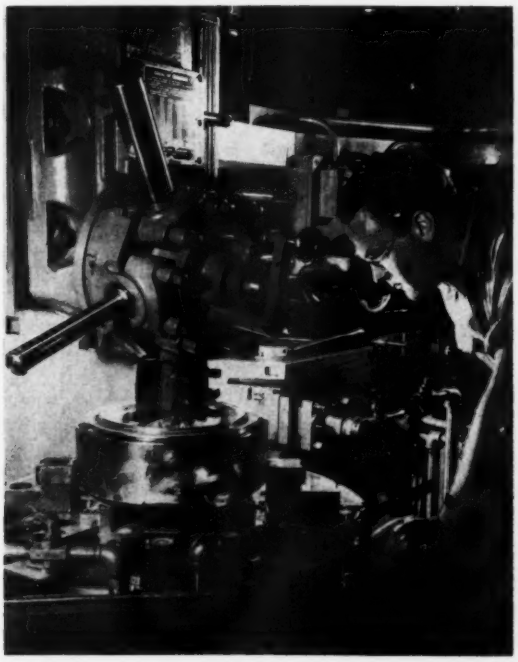
Unlike working with free-cutting metals, where moderate overheating produces no deleterious effect upon the machinability, slight overheating of relatively short duration will cause considerable work-hardening of the stainless and alloy steels.

2. Rubbing Between Cutters and Work. One of the most frequent causes of rubbing between tool and work is insufficient clearance and rake angles immediately adjacent to the actual cutting edge. Another common cause of rubbing is incorrect mounting or setting of the tool relative to the work. For instance, when machining stainless steel in any lathe it is imperative that the cutting edge of the tool is set exactly coincident with the axis of the work and not slightly above it, as is the general practice with the free-cutting metals.

Deleterious rubbing and resultant work-hardening frequently occur when a machine is being tooled up preparatory to production running. Usually the setter will rapidly set all tools to their approximate positions and will then run the machine through a few cycles employing only hand feeds to engage the tools in their cuts. Such feeding is generally far from steady, uniform or continuous, and a tool may thereby be accidentally stalled in the middle of a cut, so that rubbing and heating result.

Similarly, since the tools are not finally locked up the uneven feeding action may cause slight displacements in the settings thus leading to rubbing on the sides of some tools with consequent risks of work-hardening on the component being turned.

In machining expensive stainless steel components every precaution must be observed to insure the taking of a steady cut. Tools must be ruggedly supported. Any chatter is an invitation to work-hardening of the machined surface. A momentarily interrupted feed which permits a tool to rub rather than cut can result in a work-hardened spot due to the rise in temperature over the rubbed area. Work-hardened material offers increased resistance to further machining. Hence, when working to extremely close limits, the attaining of final dimensions becomes most difficult if not impossible.



In actual practice, a considerable proportion of work-hardening troubles arise from these and similar causes during the initial setting-up stage before normal production is even commenced.

3. Interruptions & Changes in Tool Feed. Work-hardening frequently arises even when the tool is keenly sharp and has correctly ground rake and clearance angles, if the feed rate is suddenly altered or arrested during a cut. This inevitably results in a momentary stoppage of the feed traverse and a corresponding cessation of the cutting action. If the work is rotating at high speed, as in automatic lathe operations, some rubbing must occur between the workpiece and such a momentarily stalled tool. This rubbing action, though of extremely short duration, is often sufficient to set up work-hardening effects at that point on the workpiece. Thus when the feed travel is restarted the tool will fail to pick up the cut and the well known troubles will ensue.

4. Generation of Excessive Heat. Any condition which tends to increase the generation of heat at the juncture of the cutting edge of the tool with the surface of the stainless steel workpiece will greatly increase the risks of work-hardening. Heat at such points has to be kept below a certain limit and dissipated in a much more effective and rapid manner than is necessary when machining ordinary free-cutting steels devoid of work-hardening tendencies.

Some of the most common setting-up and operating conditions occurring in practice and which lead to the generation of excessive heat, are:

(a) Too high rotational speed of workpiece or tool.

(b) Use of an intermittent, variable or too great rate of feed.

(c) Use of a blunt or incorrectly ground tool which results in rubbing and increased friction.

(d) Lack of coolant, or the use of the wrong cutting lubricant, or insufficient quantity of coolant at the cutting point.

(e) Insufficient chip clearance.

(f) Use of an improperly mounted or insecurely held cutting tool.

(g) Wrong shape of cutting tool.

(h) Insecurely gripped work-bar, which allows slippage and stalling of workpiece.

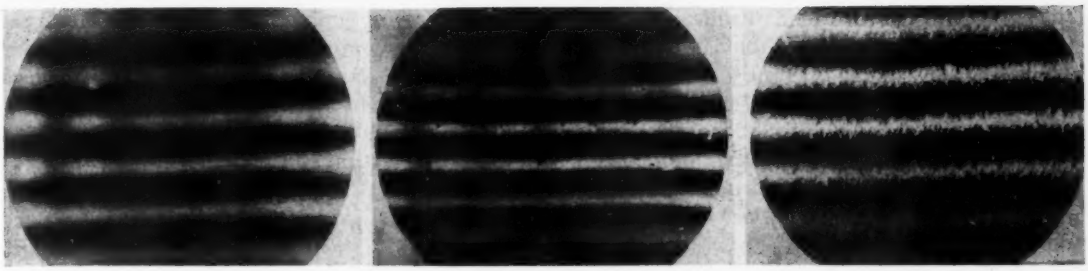
5. Insecurely Held Tools. In the operation of automatic screw machines, drill presses and turret lathes the failure to provide an effective endwise retention of the cutting tool in the machine chuck or slides, often leads to the onset of severe work-hardening when machining stainless and alloy steels. For example, where a twist drill is employed to bore a hole in end of a revolving bar in the lathe, unless such tool is powerfully and positively restrained against all tendency to push back within its holder during the in-feed, work-hardening troubles will almost certainly be experienced. In this connection, it is worthwhile noting that a drill or tool may be adequately secured to resist normal back pressures arising from the cut while its cutting edges are still sharp and therefore when the back-thrust is of the smallest magnitude. Its retention, however, may be insufficient to hold the tool firmly against the additional back-thrust arising when its cutting edges become slightly worn and dull and stock removal involves greater feed pressure.

To the extent that such a tool can move backwards in its holder during a cut, the positive in-feed movement is lessened. Thus a lighter cut, or even no cut at all, is taken and rubbing takes place, which in turn develops the high frictional heat conducive to work-hardening.

6. Insecurely Held Workpieces. A similar action results when the bar or workpiece is inadequately retained in the machine chuck, collet or fixture. This indeed is a common occurrence with automatic lathes, which extensively use

. . . Continued on page 108

Work-hardened areas will show up in surface quality measurements as high spots. These are detrimental to proper fits and can cause scoring and galling where there is relative movement between finely finished surfaces. The author points out many work-hardening preventives that can be employed to preclude the more drastic curative measures that are necessary after the damage is done.



A B C

Surface of (A) quartz optical flat, (B) Webber Laboratory Master chrome carbide block and (C) average cemented tungsten carbide block as seen through the Zeiss interference microscope. The chrome carbide shows an absence of lapping marks such as caused the ragged edges of interference fringes seen in the photomicrograph of the average tungsten carbide block.

MEASURING TO MILLIONTHS WITH CHROME CARBIDE

THE INTRODUCTION OF CHROME CARBIDE has brought about a revolutionary change in gage blocks. Chrome carbide gage blocks, calibrated to ± .0000002 (in the case of Laboratory Masters), are opening up an entirely new concept of accuracy and interchangeability. Perfectly stable, highly resistant to corrosion and wear, and far from being prohibitive in cost, these blocks are rapidly being accepted for laboratory use and for toolroom work.

Gage blocks were the first subdivision of a standard yard usable in the manufacture of interchangeable parts. When gage blocks were first conceived, steel was the best available material. These blocks were ground and finished down to a micro-finish and were measured by mechanical comparator.

The introduction of gage blocks was revolutionary in the field of metrology and made possible interchangeable manufacture. They permitted parts made in various places to be made identical.

Over the years, the art and science of gage block manufacture has progressed until the point has been reached today where gage blocks are indispensable. Today, they are put to work that is much more severe than was ever intended by their originator. They are put to work in the toolroom . . . really abused . . . squeezed into slots . . .and so on. They are working in situations where they function as both a reference master and as a working tool.

The gage block manufacturers have long sought the best possible gage block material. Among those experimented with, and some times used, were hard plating, hard surfacing, Stellite, chrome plating, and others. Some of the laminated materials were found troublesome due to poor bonding and to distortion because of the two dissimilar materials having different coefficients of thermal expansion.

Cemented tungsten carbide came into considerable prominence as a gage block material, and eventually a related material — chrome carbide — was developed. The latter had a coefficient of expansion closer to that of steel, and did not have the susceptibility to corrosion that tungsten carbide exhibited. Some very weak things, like milk, were found to attack tungsten carbide. In most less-critical applications of tungsten carbide, such corrosion is seldom a problem, and this material is still in wide use for gages. An important field of use for the tungsten carbide gage blocks is in the inspection of tungsten carbide tools, dies, and gages where identical coefficient of expansion is of value.

The many notable characteristics of chrome carbide include its resistance to corrosion; good wear resistance; a coefficient of expansion, within temperature range common to toolroom work, of 4 to 4.1 (meaning millionths of an inch per inch of length per degree of Fahrenheit)*, as compared to 6.3 to 6.5 for steel; and absolute inertness — there is no dimensional change over a period of years.

Chrome carbide also lends itself in finishing to a surface finish so fine that it cannot be checked by any of the currently available surface analyzer equipment; and, under observation in an interference microscope, it shows a surface equal to that of a quartz optical flat. Furthermore, chrome carbide is not a critical material. Also, its weight is close to steel, making it easy to handle.

It is important to note that under controlled-atmosphere laboratory conditions, and with proper gaging practices, the difference in the coefficient of thermal expansion between chrome carbide and steel is so slight that it does not present a problem. When both gage block and test piece are of the same 68°F temperature, no conversion is needed.

And in the toolroom, elimination of the many variables always present with steel blocks, and the inherently greater accuracy of the chrome carbide gage blocks, permit the latter to be used for all practical purposes without any necessity for using a conversion factor.

The freedom from corrosion, extra wear resistance and stability of chrome carbide alone justify consideration of gage blocks made from this material. The initial cost of chrome carbide gage blocks averages roughly about three times that of steel. But the longer life of the chrome carbide, the savings in block repair, recalibration, and replacement are expected to provide a cost ratio of 1:10 in favor of chrome carbide. Since chrome carbide is still young, the ultimate savings are not yet known.

Chrome carbide is available from several leading carbide manufacturers — Carboloy, Firth Sterling, and Allegheny Ludlum. All have been working to develop a perfect chrome carbide for gage blocks. These companies have spent thousands and thousands of dollars in building laboratories, production equipment, etc. Special note should be made that in production of chrome carbide, entirely different problems are encountered than in the production of tungsten carbide. This fact somewhat delayed the commercial development of the material. But, now, carbide manufacturers produce a practically perfect chrome carbide.

Several gage block manufacturers have experimented with chrome carbide, with differing results as to their ability to finish it. Upon the development of chrome carbide, Webber Gage Company of Cleveland evaluated this new material, weighed its advantages and disadvantages, and concluded that it was, indeed, worthy of an all-out effort to utilize it for gage block manufacture.

In entering upon its chrome carbide program, this company added considerable floor space to its plant, designed and built new lapping machines, and set up a very complete Metrology Laboratory in which was installed the latest testing equipment made by the Carl Zeiss and Leitz firms of Germany.

"After much experimentation and development," George Webber, Sr. has said, "we were able to produce chrome carbide gage blocks with a surface finish equal to a quartz optical flat and with perfect flatness and parallelism. After these gages were produced, we prevailed for a time upon the Bureau of Standards to calibrate these gages to the seventh place, or 1/10th of a millionth of an inch."

"Our grand masters have been calibrated many times by ourselves and the N.B.S., and there has been no discrepancy between our readings greater than a few tenths of a millionth."

A one-inch gage block of steel can be calibrated within a few millionths. According to George Webber, who makes gage blocks of both steel and chrome carbide, "The minute you use a steel block, it gets bigger. The surface gets roughed up; not necessarily scratched, just roughed up . . . sufficiently for it to change size. Chrome carbide can be finished to such a superior surface that there are no appreciable "hills" to become roughed. If the steel is scratched, a burr is raised along edges of the scratch; while, if carbide is scratched, which isn't likely, there will be no burr."

The best steel available for gage block use is subject to change of size as a result of aging. Even well-stabilized gage blocks that have been stored for a year before final touch-up and shipment to the customer, will change still more in following years. Chrome carbide will exhibit no growth whatever, even after years of use.

According to Webber, steel cannot be finished to a good enough surface finish to permit accurate calibration to the 7th decimal place; only to 6 places. Furthermore, each time steel gage blocks are wrung together in use or wrung to a reference surface, the gage block surfaces are so affected as to tend to provide a different reading. For many applications, this difference is too slight to matter. But, the gage block user will get an exact reading on each block to the 7th place, and repeated calibrations will provide identical readings. This greater accuracy is becoming more and more important.

. . . Continued on page 116

How to

AUTOMATE YOUR PLANT

by Charles F. Hautau
HAUTAU ENGINEERING COMPANY
Detroit, Michigan

AUTOMATION has successfully passed through the stages in which it was first a scientific curiosity and then a rich company's toy. It has now reached a level of maturity where a large number of companies realize that they should automate to increase productive efficiency or that they must automate in order to keep up with competition. In today's management-conscious society the problem of how to organize a company's expedition into automation is receiving a lot of high level attention. The theme of the recent American Management Association Conference on automation in New York seemed to be "how to automate" rather than "what is automation?"

Although automation has definite limitations and is in a sense a tool such as time study, management realizes that something more is required of them than simply telling their subordinates to take advantage of the opportunities that automation offers. Bringing automation into a plant requires not only a revision of engineering organization but involves an entirely new type of thinking — something that is not easy to develop.

Since our company has been engaged in automation activities since some time before the word was defined, I feel qualified to present my views on what type of engineering setup and procedure lends itself to the accomplishment of a successful automation program. It should be kept in mind that — like the ingredients of a prize winning cake — some of the elements that I am going to mention may be varied in quality or left out entirely without ruining the final result. Automation has been applied through other systems many of which are much simpler, but experience has taught me that each of these elements has something to add to the final result.

Coming in an Early Issue

A complete history of an outstanding example of coordinated product-process engineering inspired by the desire to automate.

Who Should Do It?

The first problem to consider is who shall handle the problem of automating your operations. Can you use your existing staff, or will it be necessary to hire outside specialists or to engage the services of an automation consultant? The correct solution to this problem of course varies with each company. The company's size alone is not the determining factor since the largest of corporations such as General Motors and General Electric find it advisable to consult with independent experts before arriving at the solutions to their automation problems, while relatively small companies have successfully hired permanent automation engineers.

The first possibility is to use your existing staff. As I will bring out later, successful automation always involves the activities of a group of men rather than one man. Therefore, this solution is only possible in a company large enough to divert the services of several engineers to full scale automation activities without impairing their normal production activities. Another disadvantage of this procedure is the fact that successful automation involves the application of a wide range of experience, and the viewpoint of a company's engineers is often limited to a single industry. Again, since automation requires fresh outlook and the consideration of every possibility, not only those that have proved successful in your plant, it is often found that automation created by a company's own engineers will always seem strikingly similar to the pre-existing facilities.

Another possibility is to hire your competitor's engineers. Here are men who are well versed in not only your problem but in a different approach to your problem. They can

Fig. 1. To gain the experience and thoughts of several minds, it is important that the automation survey be performed by a group rather than an individual.

usually be hired at reasonable wages and the problem of locating them is greatly simplified. In some industries this procedure is very commonplace. Very few automotive engineers in Detroit have been employed for ten years without working for two of the big three. The disadvantages of this procedure are that your automation may reach the productive level of your competitor's but will very seldom exceed it, and you do not get experience from analogous but non-allied field that is so valuable.

Another way to obtain men to institute an automation procedure at your plant is to hire men who are not experienced in your exact manufacturing problems but who do have a wide range of manufacturing experience. There is growing tendency for these men to call themselves automation engineers and they are greatly in demand. If your company can afford to engage a separate engineering staff to handle your automation activities, you may find this a very successful approach.

An excellent example of this approach is the General Motors Process Development Section. This group was formed in 1946 when General Motors realized that the manufacturing engineers in their divisions did not have the necessary experience or time to develop radically different production processes. Therefore they created a completely autonomous engineering section and equipped it with the latest in production machines and experimental equipment. General Motors' total outlay for this department must go well into the hundreds of millions of dollars, but the cost savings that result from the operation is undoubtedly doing more than paying its way.

The most commonly used method of obtaining manpower to appraise and automate a company's productive facilities is the use of consulting automation engineers. Major companies use consultants in addition to their own staffs, and the smaller companies find that consultants are the only way they can afford to automate. A good consulting outfit is measured not only in terms of its productive experience but also in terms of range of experience.

There are very few basic production processes, and the wide variation that is found in the productive processes used in different industries is often a result of habit and historical influence rather than sound engineering practice. It is surprising how many techniques that are used in a highly-automatic industry such as packaging may be adapted to such diverse industries as shoe manufacturing and spring production. When a consultant works for your company, he not only gives you the benefit of his wide range of experience but he also receives the benefit of being able to study your production processes and being able to add them to his repertory of engineering know-how.

Analyze Present Practice

Once it has been decided exactly which group will perform your automation activities, it is necessary to plan out a program for them. The first step is obviously an analysis of your present practice. Not only the productive processes themselves but the actual product design should be considered and analyzed from the standpoint of why that particular design or operation was originally arrived at. Consumer preferences and packaging conveniences should be weighed against production conveniences.

It is at this point that your employees and probably those engineers who were hired from your competitors are at a disadvantage with respect to outside consultants or automation engineers. Your employees have gone past the point of being able to question your product. They very often accept present practices as being the right way to produce a part . . . simply on the basis that you have been producing the part for a long time, probably without any particular trouble. Furthermore, it

may be recalled that these practices were adopted only after long investigation and represented the most advanced art in your industry at that time.

At this stage of the game the most effective man is the one who has never seen operations of your sort performed. He will naturally analyze your processes from the standpoint of why they were adopted, and to what extent the controlling factors still exist.

It is essential that the design of the product be considered as well as the production processes. Very often it will be found that a peculiarity of design that makes it extremely difficult to produce a part was introduced by design engineers who either lacked knowledge of production processes or simply didn't consider them; and, when a new process becomes available, the production engineers consider its possibilities with respect to the existing design rather than checking to see if the design can be altered to take advantage of the new process.

After every element of the design and production has been considered from the standpoint of efficiency and from the standpoint of possible introduction of new processes and designs, a group of engineers should thoroughly discuss the existing processes and the possible innovations. As I mentioned before, it is essential that the automation be performed by a group rather than by one man. Of course the group needs leadership, but it should be leadership and direction rather than control. Since each man's thoughts and ideas are a result of his own experience, in order to obtain the widest range of ideas it is necessary to use as large a group of men as is efficient. The discussion at this point should not attempt to develop a tentative method of processing.

After the initial group discussion, research should be done in how other people are solving similar problems. Please note the sequence. It is essential that the automation group be made aware of additional existing practice after and not before their initial discussion and trading of ideas. The best automation solution is arrived at by a group of unbiased minds but, of course, they should not be kept ignorant of all existing practice. Our experience has proved that the study of existing practice in other companies should include two phases. The first step is to find out what your competitors are doing. If they are friendly competitors, the best way is to go through their plants. Otherwise you may check with an ex-employee of theirs who now works for you, or simply ask around.

Study Patented Art

The second method of determining existing practice is definitely not in common use today, but our company follows it consistently and highly recommends it. This is the investigation of the patent status of the processes you are considering. You should investigate both expired patents and those that are still in force.

Because a process was invented 17 years ago does not mean it is obsolete. Very often the economics of a certain period are such that a very worthwhile process is not put into practice. It may simply have been ahead of its time, or no real need for it existed at the time it was invented.

Just because a process is covered by an existing patent does not mean that it should be eliminated from your thinking. I would estimate that 95% of the patents in force today can be licensed at very reasonable figures. In fact, you can get royalty-free licenses on most machines since the owners of the patents are usually interested only in protecting their particular industry and do not care if their inventions are used in other analogous industries.

Therein lies one of the great advantages of a patent search. It can cover analogous methods of manufacture as well as the manufacture of your particular industry. Therefore it locates those practices which were developed in other industries and would be valuable to

Fig. 2. A tentative automation program should be outlined so that its economic advantages may be calculated before construction is started on the project.

you but which would never be brought to your attention otherwise. Our company employs a patent engineer who divides his time between protecting our new developments and conducting prior art searches before an automation program is solidified. We find it to be an excellent investment.

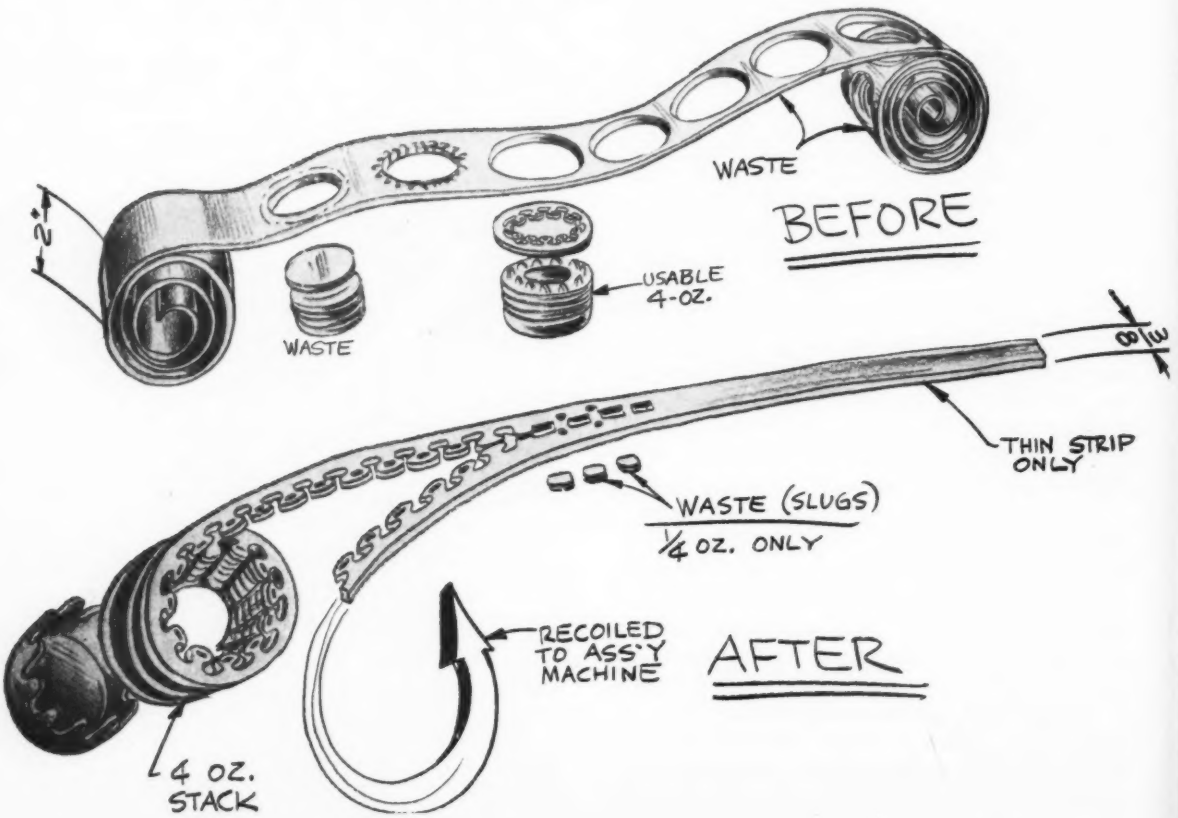
After your group has talked over your existing practices and considered possibilities of innovation and been made aware of practice in both competitive and analogous industries. they must arrive at a tentative automation program. This solution should not include details of construction but rather should deal with the type of equipment being considered for use and the possible changes in design features of the product. It is often advisable to prepare preliminary drawings that cover the basic structure and nature of the changes. We have found that the cost of this preliminary work will seldom exceed in cost, and should not exceed, 5% of the estimated total investment.

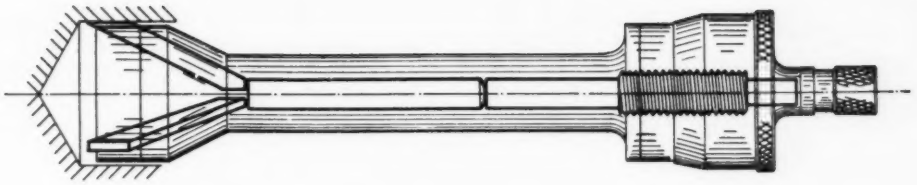
The purpose of arriving at this tentative solution rather than a final one is to allow an economic study of the proposed plan. If it were to be put in operation, exactly what cost savings would result? The economic study might as well be a detailed one since its cost is little and it can be performed by a single man. Often it is only necessary to consider increased production that will result from an automation program before it is apparent that the plan has economic advantages. In other situations a detailed cost study must be performed because of the borderline nature of the automation activities.

The proposed tentative cost of the automation changes must include provision for possible bugs that always arise in tryout. A consultant's overall figure will always include contingency monies. There, many consultants like to quote a maximum figure and pass on any savings to your organization. After the

. . . *Continued on page 118*

Fig. 3. The automation survey must study the product design as well as processing. Here the manufacturer of a clock motor had been forming shading rings from a stack of stamped laminations. By redesigning his product to take advantage of automation machinery, he saved 4c per part.





THE PRECISION MEASUREMENT OF CYLINDRICAL BORES

by Prof. J. C. Cherna
McGILL UNIVERSITY
and
B. Goode, Sales Engineer
ALINA CORPORATION
New York, N. Y.

THE DESIGN OF A PRECISION TOOL for measuring the diameter of cylindrical bores or holes must be predicated on a recognition of the common geometric errors which may exist in ostensibly circular cross sections. Unless the measuring anvils are properly located geometrically many of these errors may remain undetected, and a bore may be measured and found to conform to the prescribed high and low limits and yet so far out-of-round as to fail in such essential characteristics as bearing area, wear allowance, or permanent tightness of a press fit.

The design of the new Etalon Ingage is the end result of a study made toward resolving the difficulties associated with the diametrical measurement of bores or holes.

First, it was necessary to determine the major deviations from a true circle that would be most generally encountered. Next, it became essential to examine the methods by which these deviations might be both detected and measured.

The Geometry of Circular Forms

Reference to Figure 1 which depicts the definition of a circle is the proper start for the discussion to follow. With a circle being defined as the locus (or path) of all points at a constant given distance R from a given center C, it is plain to see that a geometrically accurate, point-by-point, measurement of the correct geometrical relationship may be obtained only if the location of the center can be established (and used) as one reference contact for the measuring instrument.

For solid rotation bodies of circular cross-section (cylinders), a centerline can usually be established without great difficulty. This centerline is the locus of all the centers of the individual circles found in perpendicular sections to the cylinder. In metal working, centerbores are usually incorporated in cylindrical workpieces. These centerbores locate the ends of the axis of rotation and can also be used for measurement reference as shown in Figure 2.

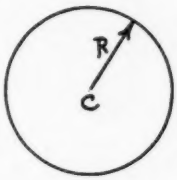


Fig. 1

In the case of a cylindrical hole or bore, it is not possible to establish the centerline without elaborate auxiliary reference equipment, because the geometric centerline is located in space. Thus, accurate radial measurements (in conformance to the basic definition of a circle) can not be made.

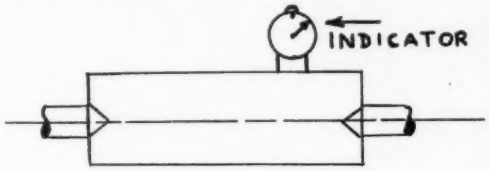


Fig. 2

Therefore, a two-point diameter measurement can be substituted but not without certain risks of inaccuracy. Assuming a true circle, the diameter, Figure 3, has to pass through the center of the circle; it should not be a

Fig. 3

chord. The center should also be the midpoint of the diameter.

Common Errors in Circular Cross-Sections

Departures from a true circle take many forms. Some of these are definable as traditional geometric shapes but more often they are mixtures, compromises, and distortions. Thus they complicate the measuring problem.

The elliptical form, Figure 4, presents maximum and minimum values in two perpendicular axes, corresponding to the major and minor axes of the ellipse. All other diameters have intermediate values.

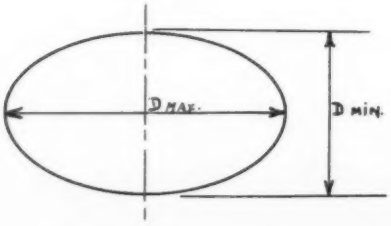
The three-arc shape of equal diameter is shown by Figure 5. This is an area resembling an equilateral triangle with rounded corners. It is characterized by a constant distance between any pair of parallel tangents and three maxima for the radius R.

Regular polygons of odd-numbered corners (like pentagons etc.) have very similar properties, but will show minute variations in the distance across flats. This distance between tangents is nearly constant and its detection is very difficult. A regular pentagon with rounded corners is shown in Figure 6.

Square (Figure 7), hexagonal or octagonal shapes (regular polygons with an even number of corners) with rounded corners have properties similar to those of an ellipse. The distance across "corners" and "flats" will vary sensibly. The number of maxima and minima will correspond to the number of corners.

Figure 8 is a representation of correct circles with one limited zone of inaccuracy; negative or positive deviations from the ideal shape.

Fig. 4



The Relative Merits of Measuring Methods: Two-Point Measurements

A two-point instrument will give correct readings of D (Max) and D (Min) on a true el-

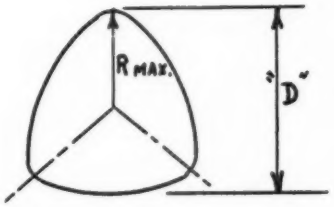


Fig. 5

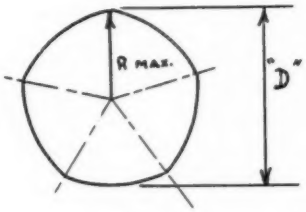


Fig. 6

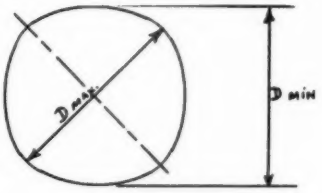
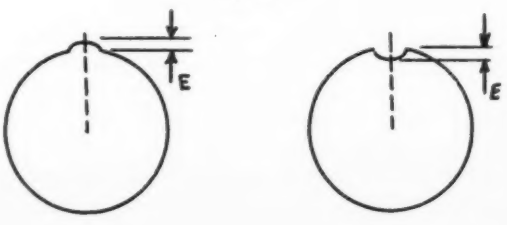


Fig. 7

liptical shape, Figure 4, or a true polygon with an even number of "corners", Figure 7, indicating two, four or more maxima respectively. If the polygonal or elliptical shape is not symmetrical to its axes, the measurements of the two-point instrument will have a wandering center and eventually even include chords instead of diameters.

The two-point instrument will not detect any deviation when applied to three-arc or five-arc irregular shapes. The chords measured will

Fig. 8



all be of practically equal length and the instrument gives a wrong indication of the shape of the hole. Figure 9 shows how the three- and five-arc polygonal shapes, with A = A and B = B, are indicated as circles by a two-point instrument.

Symmetrical Three-Point Measurements

A measuring tool with three equi-spaced (120°) measuring anvils is depicted in Figure 10. This instrument will detect the three maxima and minima of a three-arc "triangular circle". The ratio between the highest and the lowest reading would be 2 to 1 in the case of a sharp cornered equilateral triangle, assuming a point contact between measuring anvil and workpiece.

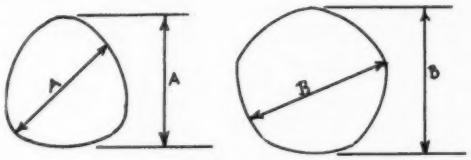


Fig. 9

On a "triangular circle" with smooth rounded corners as encountered in practice, a ratio of 3 to 2 or 4 to 3 will be observed, depending on the sharpness of the inside corners and the width of the measuring anvils. The readings taken are not absolute values, because the center of the instrument shifts to a different location for every angular displacement of the three measuring points.

Fig. 10

The same instrument (symmetrical three-point) will fail entirely in a theoretically correct elliptically shaped bore. As disclosed by the geometry of Figure 11, no diametral deviation will be shown by the instrument because it is possible to inscribe a constant size triangle anywhere within a given ellipse.

Unsymmetrical Three-Point Measurements

The design of the Etalon Ingage conforms to the geometrical considerations covered by the foregoing analyses. Accordingly, its measuring anvils for use in bores greater than 0.8" in diameter are three in number and they are disposed at angles of 90°, 135° and 135° as shown in Figure 12. This arrangement permits detection of any of the above sources of geometrical error. It indicates the type of inaccuracy without, however, being able to indicate the exact numerical value of the deviation.

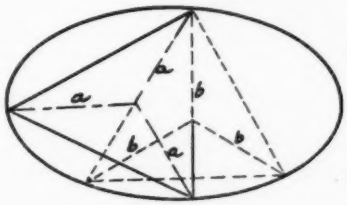


Fig. 11

The practical merit of the design lies in the fact that it detects any type of departure from a true circle, and the maxima and minima diametrical values show their presence if not their full magnitude. The geometrical shape of a bore can be determined by the number of maxima measured.

Conclusion

The essential point is that it is possible to obtain a full reading of the error in diameter, as detailed above, only for correct elliptical shapes and by using a two-point measurement, Figures 3 and 4. For any other shape it would be necessary to establish the center-point "in air", which is hardly possible.

Practical irregularities on the other hand will rarely follow a theoretical geometrical shape, most cylindrical holes will only approximate any of the described forms of irregularity and the probability of an elliptical hole will not be greater than that of a polygonal false circle.

The three-point instrument with the described arrangement of measuring points incorporating one pair of points at right angles will be, therefore, the most universal indicator of diametrical inaccuracies. The difference between the maxima and minima readings will be large enough to indicate whether the

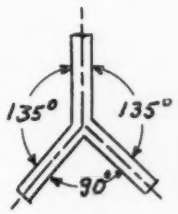


Fig. 12

produced workpiece is within the required tolerances. The observation of the angular distribution of the maxima values on the other hand will disclose the pattern of the configuration.

NUMERICAL CONTROL OF PRECISION MILLING

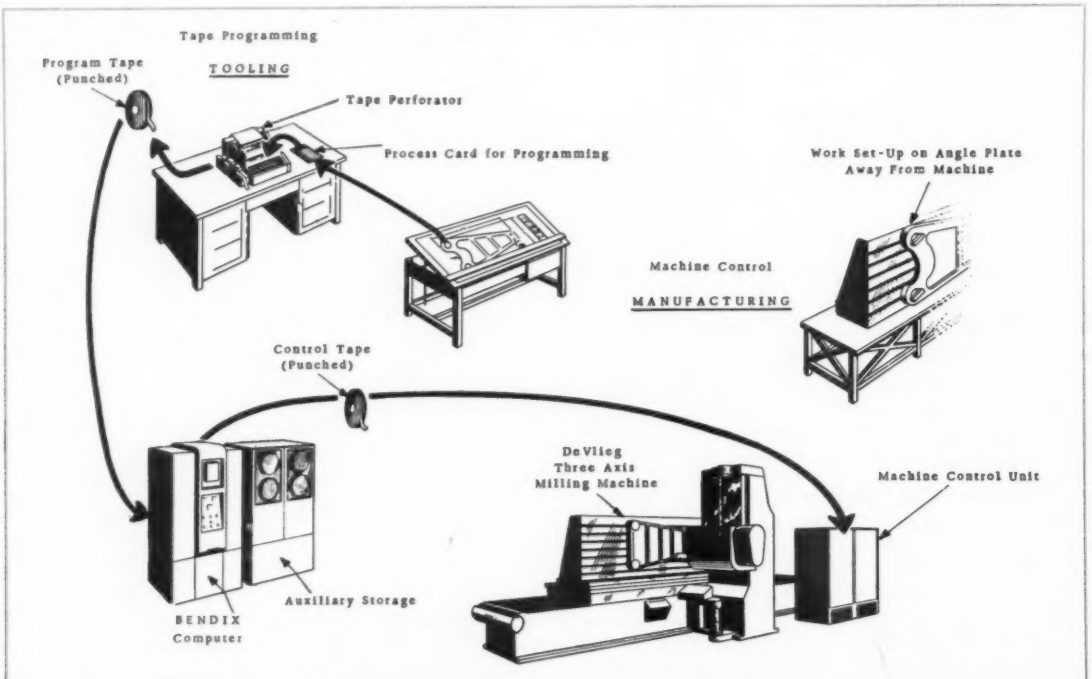
CLIMAXING MORE THAN A YEAR OF STUDY of automation techniques in aircraft production, Martin Aircraft has awarded a contract to Bendix for a numerically-controlled milling machine. The Bendix electronic control system will be applied to a precision DeVlieg horizontal milling machine.

Automatically-controlled machining is expected to aid Air Force production programming by reducing the time span for producing new models, from designer's plans to tactical weapons, and by providing a flexible, almost instantaneous means of mobilizing production in the event of an emergency.

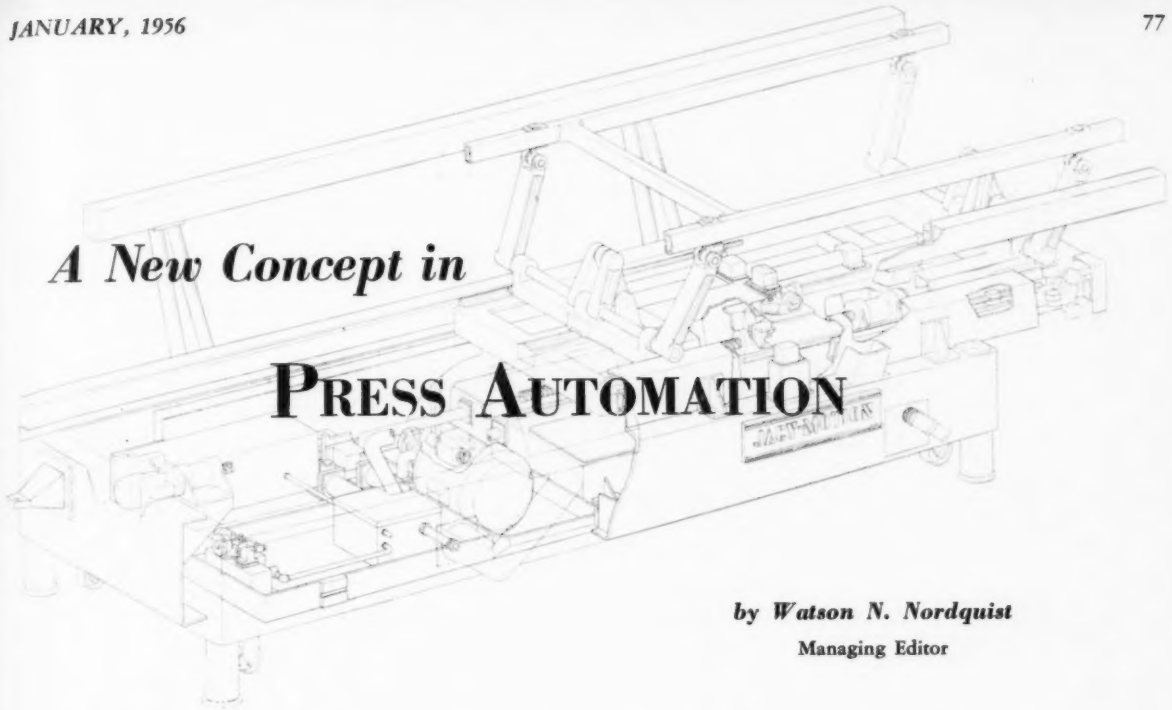
Tape is a compact storage medium for design data. It is economical, comparatively non-perishable and quickly available for reuse. It can be delivered quickly to subcontractors' plants; its impulses can be transmitted via teletype circuits to one or more dispersed machines; or it can be duplicated as needed.

Martin's new milling installation will include a tape perforator to be used by tool engineering to program the machine operation for each part to be produced. The program tape will be fed into a computor which will convert program data into control data punched on a machine control tape. Numerical data for cutting standard arcs and other routine movements will be programmed on magnetic tape and stored in the auxiliary storage unit. When such movements occur in the program for a specific part, the director-computor automatically draws this data from storage. The control tape will then be used in the machine control unit to guide the movements of the milling machine cutter to produce the part.

The milling machine will be a standard production model DeVlieg precision, three-axis, horizontal milling machine. The horizontal spindle machine was selected for its inherent rigidity in the machine frame, versatility in function and work range, convenient operator position, convenience of set-up, and natural drainage of chips and coolant.



NUMERICALLY CONTROLLED MILLING MACHINE



A New Concept in

PRESS AUTOMATION

by Watson N. Nordquist
Managing Editor

ONE OF THE LATEST MAJOR ADVANCES in automatic production is the development of a versatile, standardized transfer unit of the lift-and-carry type for the automatic progression of pressed metals from operation to operation.

Stampers of medium sized panels know well the problems involved in speeding up present press lines. Partial automation — sheet feeders, mechanical arm unloaders, and conveyor units that carry a panel to the loading position — has gradually evolved during the last decade and has been extremely valuable to countless plants. But partial automation has not entirely eliminated back-breaking labor; nor has it eliminated handling damage to polished work and tool surfaces; nor has it caught up with the inherent productive potential of modern presses.

Full automation is here . . . now. As conceived by Modern Engineering Service Company of Berkley, Michigan, the Jacy-Motion approach to press automation calls for a totally-unified system of presses, dies, sheet feeders, transfer units, and controls. From one end of a line to the other, the workpiece is automatically picked up, carried, and deposited . . . station to station. Press action is synchronized and interlocked with work transfer, and —once the line is running—no operator is required except to monitor the various operations.

The prime result is a higher production rate. Secondary benefits are higher quality work (no handling damage to the workpiece), longer die life (work is not dragged over or dropped onto polished die surface), less floor space under certain conditions, elimination of operator fatigue and accidents, generally quieter operation of the line, and lower labor cost per piece.

In the production of truck hood panels, for instance, application of Modern's Jacy-Motion concept will increase immediately the rate of production from about 225 pcs/hr to about 350 pcs/hr, and over a period of time the rate can be increased still further. Smaller workpieces are handled much faster. Feeder skirts in the same plant, for instance, are processed at the rate of about 600 pcs/hr.

The basic building block of the system is a standardized and highly versatile, portable transfer unit of the lift-and-carry type recently developed by Modern. It is positioned between two presses and held in proper alignment with the dies at either and by means of coordinating brackets.

By means of combined lead screw and hydraulic cylinder action, two parallel transfer rails on the transfer unit reach into the press,

FULL AUTOMATION: ***Continuous cycling of a press line . . . or a pressed-metal assembly line . . . made possible by introduction of a new lift-and-carry type transfer unit.***

elevate to lift the workpiece from off die lifters, retract along a higher level, and descend to deposit the workpiece on suitable locators mounted on outer stationary idle rails. On following indices, the transfer rails pick up the workpiece from this idle position and move it on to the next, and eventually deposit it in a die in precise position for the next press operation.

These tooling rails are designed for the specific application. They are fitted with bracket-mounted locators—blocks of a relatively soft material such as reinforced plastic or aluminum to suit the configuration of the workpiece at point of contact. These locators not only provide positive control of the workpiece as it moves through all stations but also protect the workpiece against handling damage.

Any given point on the transfer rails follows a rectangular path, permitting work to be unloaded and loaded without dragging.

Typical Automated Line

An excellent example of the practical application of the Jacy-Motion system is found in the production of truck hood panels, as depicted by the 3-D concept drawing on the following four-page foldout.

Stacked hood panel blanks are brought from the leveling machine and blanking press by roller conveyor and fed into the Jacy sheet separating mechanism. This unit is provided with permanent magnet type sheet separators that fan the uppermost sheets, permitting electromagnets on an overhead shuttle-type carrier to pick up one sheet at a time and feed it onto a tilting-top elevator device in the Jacy sheet feeder.

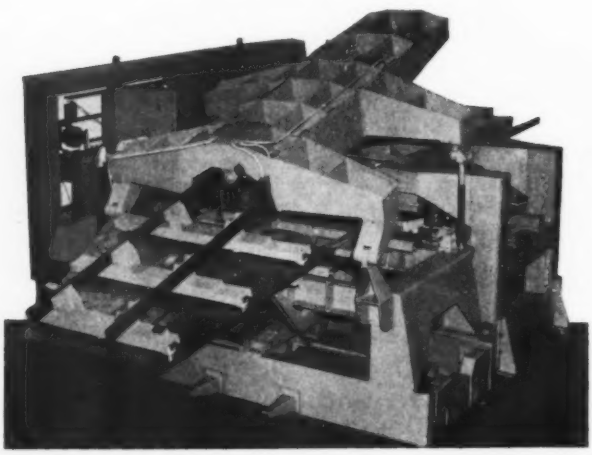
In certain types of draw dies having angular or compound angular binders, it's necessary to feed the blank in at an angle. To do this, the sheet feeder unit is designed to permit adjustment of its feed slide or carriage to the exact angle and stroke length required. The sheet that is on the elevator device is swung up into contact against electromagnets mounted on the bottom of the feed carriage.

The carriage then indexes, with a straight-line motion, to carry the blank into the draw die at a proper attitude. Stock lifters built into the die are designed to register the blank exactly as required. This first operation — the drawing of the hood — is performed in an 850-ton Danly underdrive double-action press with Dynamatic drive.

Following the draw and as the ram rises and approaches top dead center, the transfer rails or arms on the Jacy-Motion transfer unit between the first two presses move in beneath the drawn panel, lift it from the die lifters, and then with a longitudinal motion carry the panel out of the press. At the end of the carriage stroke, the transfer rails descend, depositing the panel on a pair of turn-over arms.

The turn-over arms, equipped with electromagnets, then index the panel through 180° to deposit it in inverted position on the idle rail locators. On the next cycle, the inverted panel is picked up by the transfer rails and moved into the second press, a Clearing four-point, single-action press, where it is deposited on the lifters built into the trim die. The transfer mechanism retracts, the press ram descends, and the binder and flash is trimmed from the drawn panel.

As the press opens and the ram approaches top dead center, the transfer rails on the next Jacy-Motion unit move in, up, out, and down, leaving the trimmed panel positioned on the idle rail locators. This unit has two idle stations between the trim operation and the next. So, on the second index of the transfer mechanism, the panel is moved from one idle station into a second. And, on the third index the



The sheet feeder unit, with carriage shown at feed end of stroke, presents blank to die at proper attitude to facilitate the draw operation. Shown immediately behind the feeder is the sheet separator unit that accepts a stack of flat sheets and fans them, permitting a single sheet to be indexed into the feeder.

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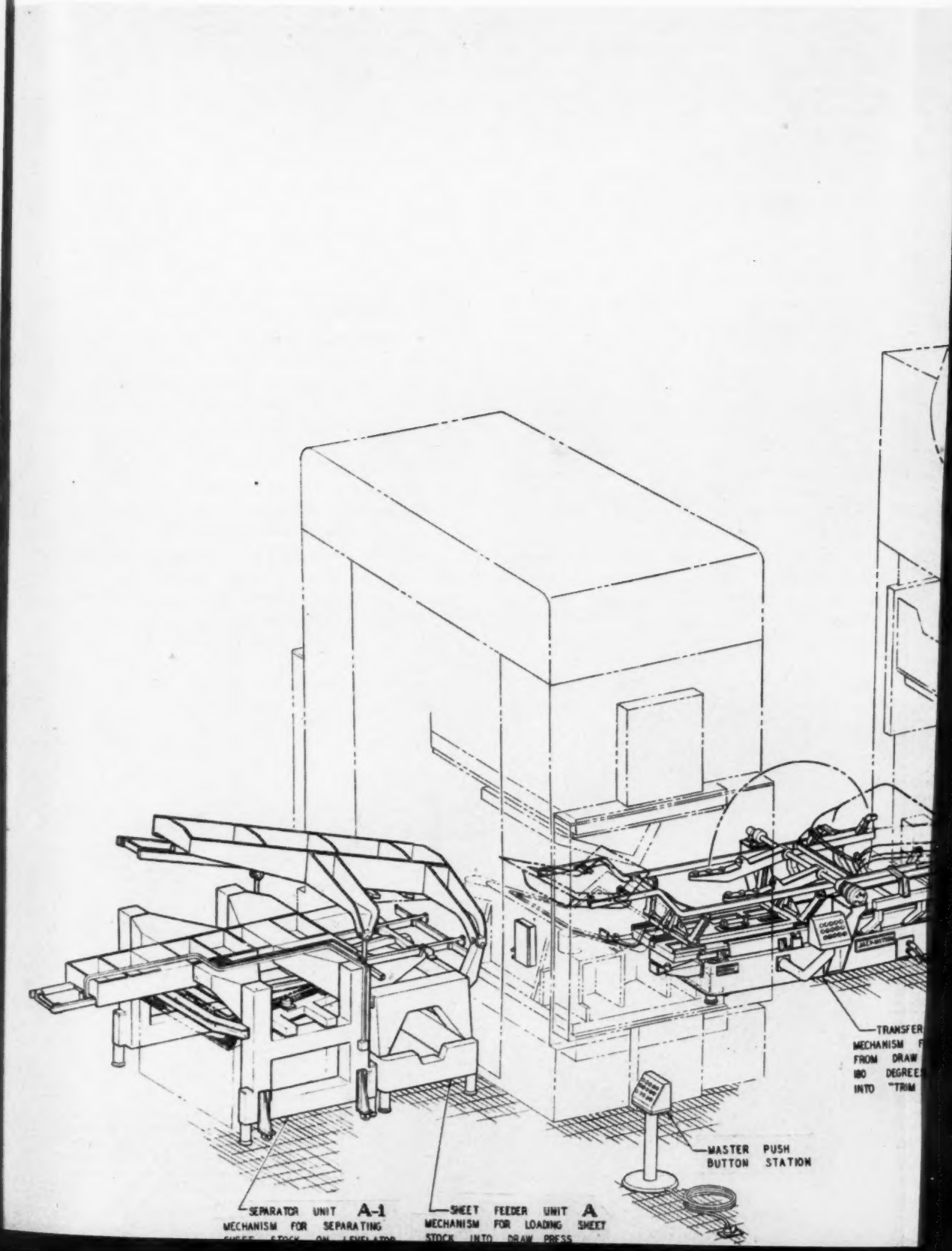
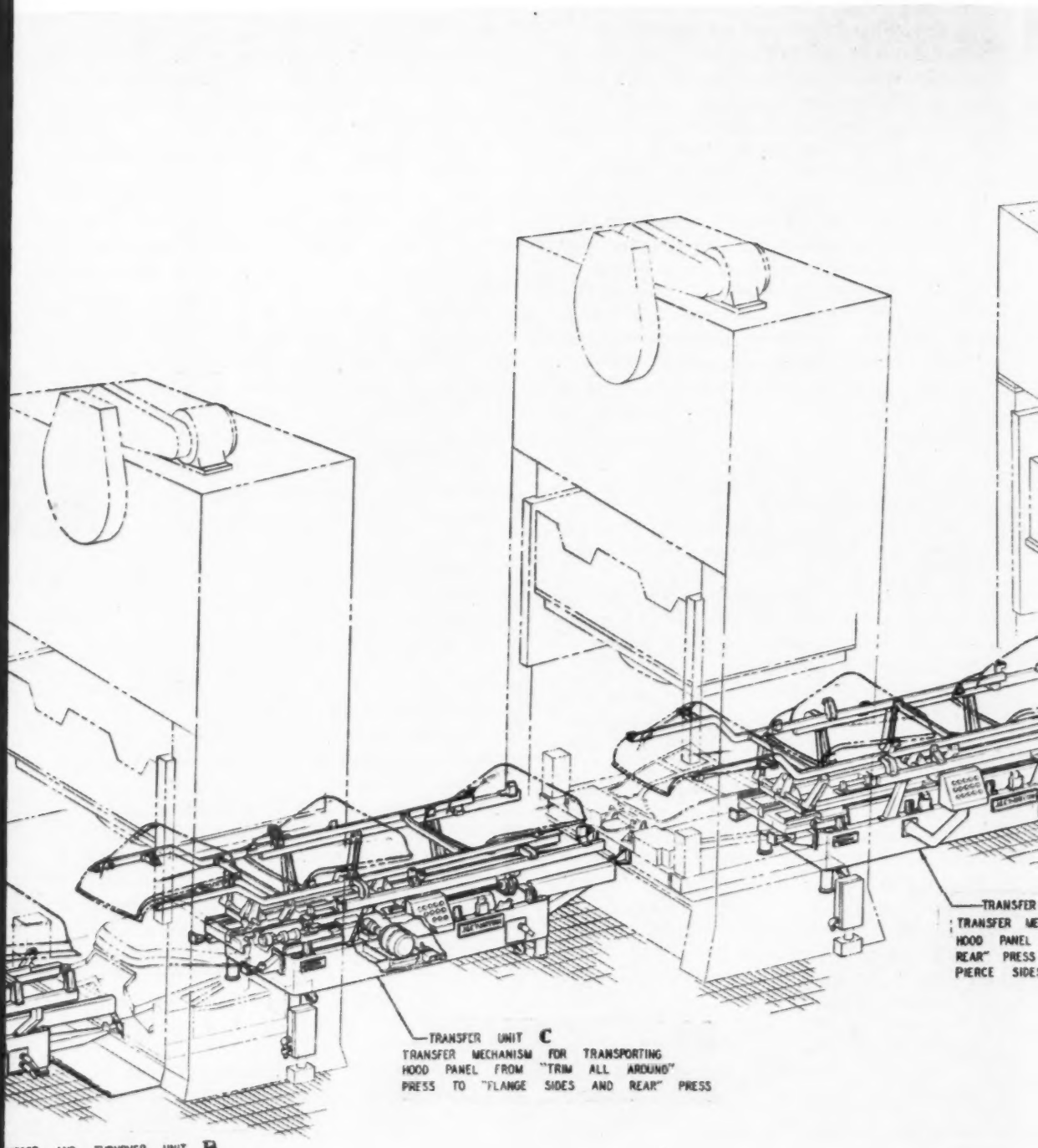
CONCEPT DRAWING OF AUTOMATED PRESS LINE


SEPARATOR UNIT A-1
MECHANISM FOR SEPARATING
SHEET STOCK ON ELEVATOR
SHEET FEEDER UNIT A
MECHANISM FOR LOADING SHEET
STOCK INTO DRAW PRESS
MASTER PUSH
BUTTON STATION
TRANSFER
MECHANISM F
FROM DRAW
180 DEGREES
INTO "TRIM

AUTOMATE
For Production Of

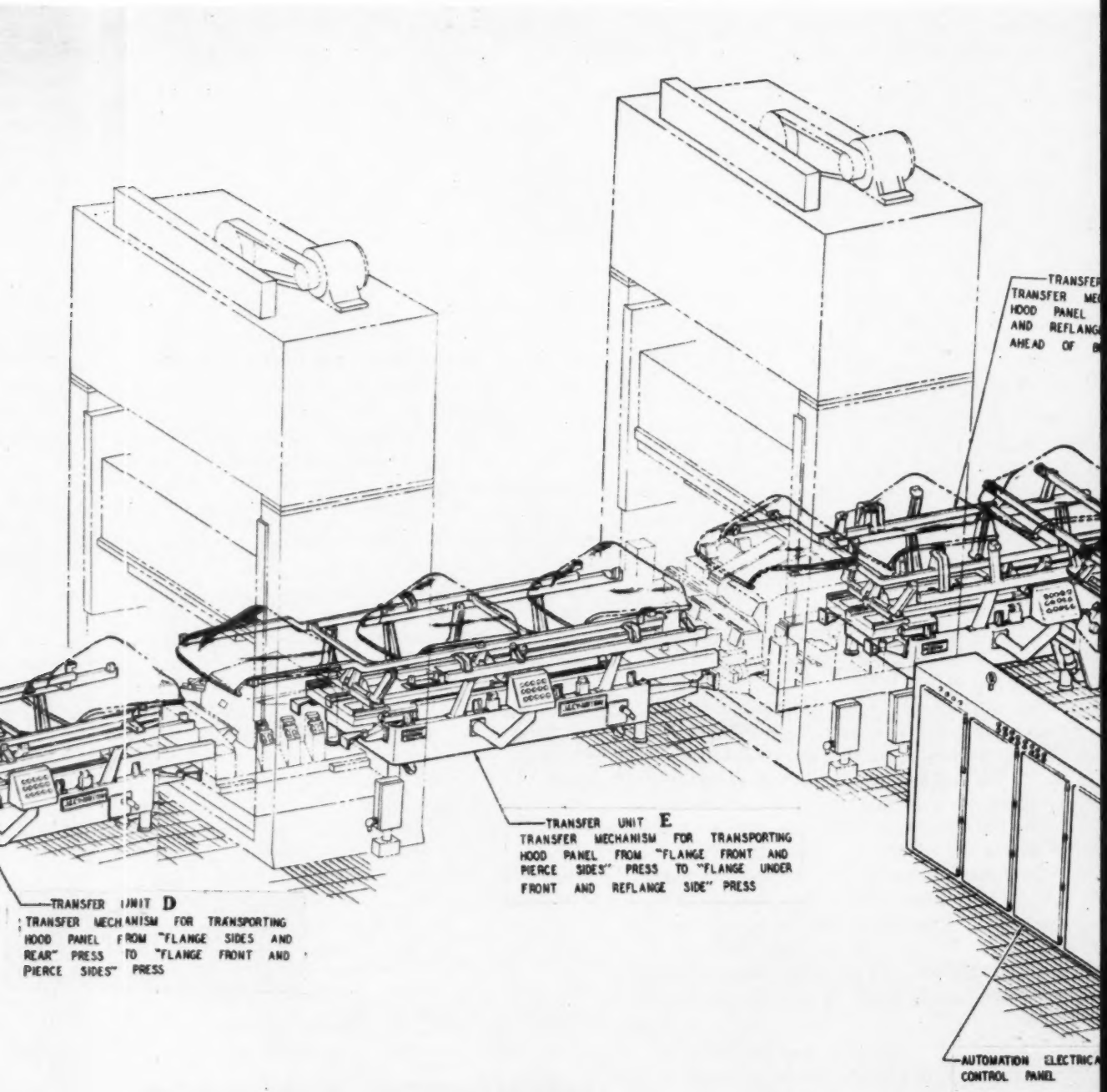


TRANSFER UNIT **C**
TRANSFER MECHANISM FOR TRANSPORTING HOOD PANEL FROM "TRIM ALL AROUND" PRESS TO "FLANGE SIDES AND REAR" PRESS

NSFER AND TURNOVER UNIT **B**
SM FOR TRANSPORTING HOOD PANEL
DRAW PRESS, INVERTING PANEL
EGREES, AND TRANSPORTING PANEL
"TRIM ALL AROUND" PRESS

TRANSFER
TRANSFER ME
HOOD PANEL
REAR" PRESS
PIERCE SIDE

MATED PRESS LINE
on Of Truck Hood Panels


TRANSFER
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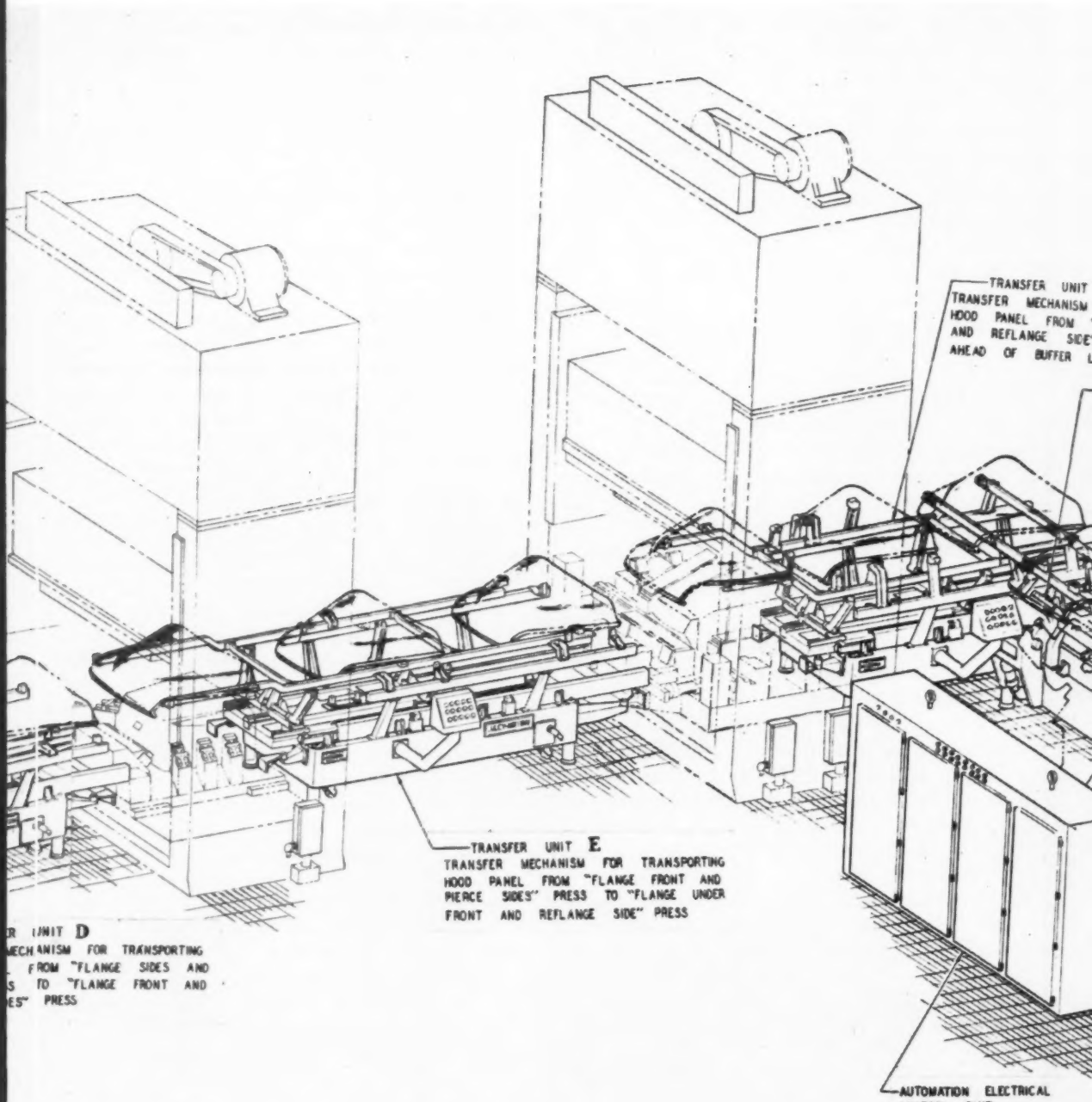
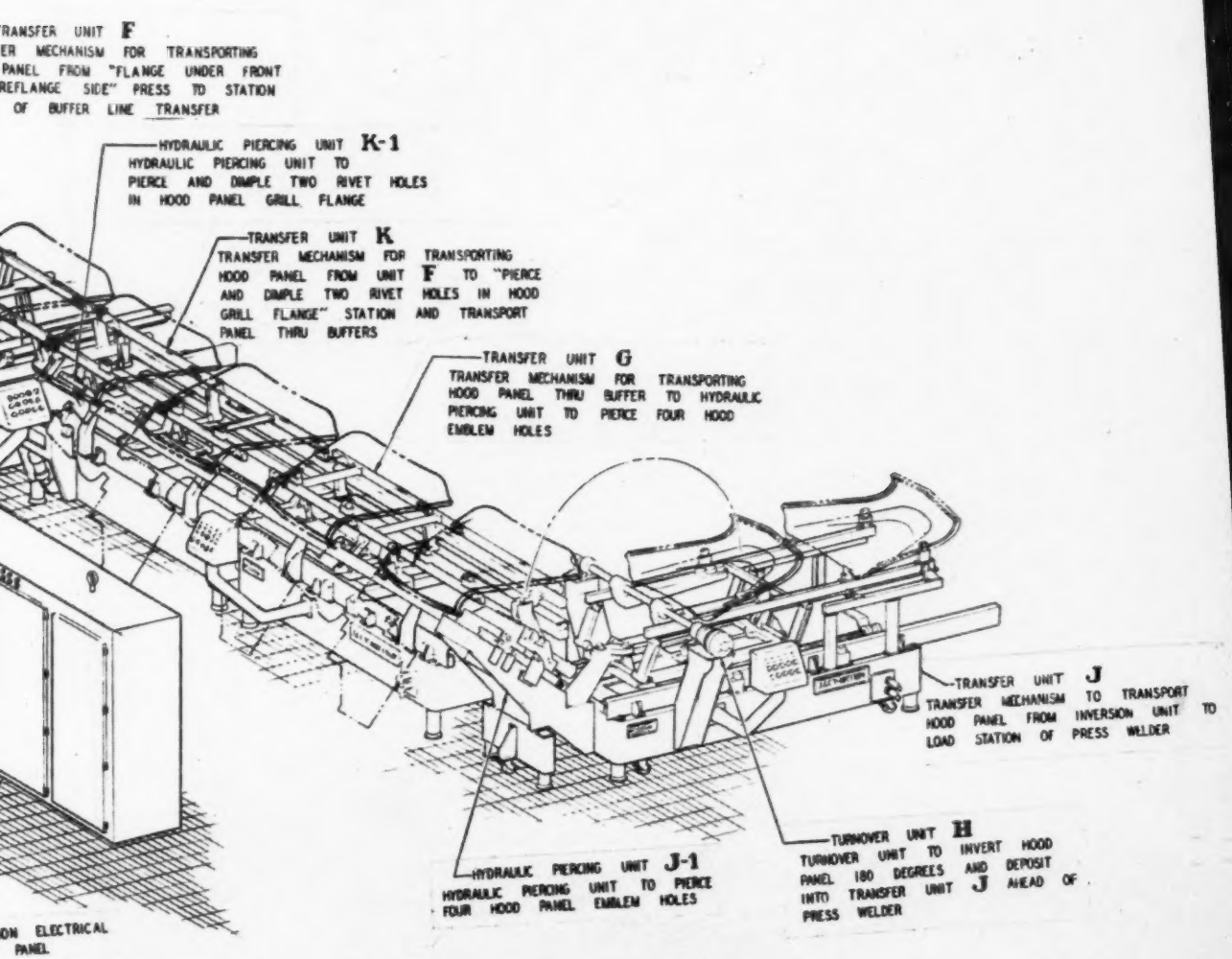
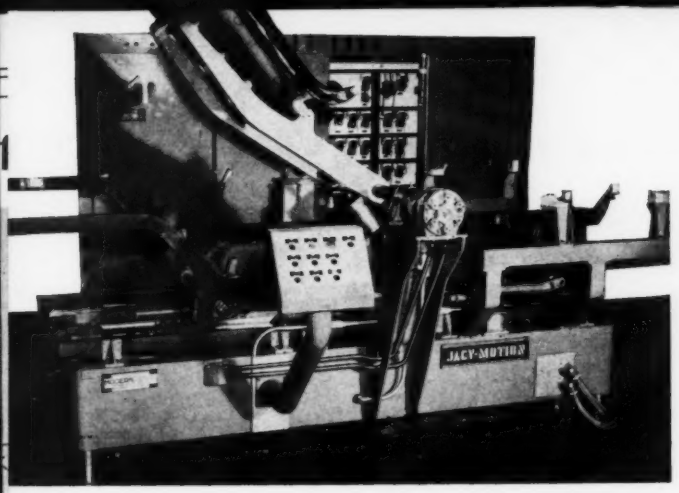
TRANSFER UNIT E
TRANSFER MECHANISM FOR TRANSPORTING HOOD PANEL FROM "FLANGE FRONT AND PIERCE SIDES" PRESS TO "FLANGE UNDER FRONT AND REFLANGE SIDE" PRESS
TRANSFER UNIT D
TRANSFER MECHANISM FOR TRANSPORTING HOOD PANEL FROM "FLANGE SIDES AND REAR" PRESS TO "FLANGE FRONT AND PIERCE SIDES" PRESS
AUTOMATION ELECTRICA
CONTROL PANEL

ED PRESS LINE
f Truck Hood Panels




RANSFER UNIT F
ER MECHANISM FOR TRANSPORTING
PANEL FROM "FLANGE UNDER FRONT
REFLANGE SIDE" PRESS TO STATION
OF BUFFER LINE TRANSFER
HYDRAULIC PIERCING UNIT K-1
HYDRAULIC PIERCING UNIT TO
PIERCE AND DIMPLE TWO RIVET HOLES
IN HOOD PANEL GRILL FLANGE
TRANSFER UNIT K
TRANSFER MECHANISM FOR TRANSPORTING
HOOD PANEL FROM UNIT F TO "PIERCE
AND DIMPLE TWO RIVET HOLES IN HOOD
GRILL FLANGE" STATION AND TRANSPORT
PANEL THRU BUFFERS
TRANSFER UNIT G
TRANSFER MECHANISM FOR TRANSPORTING
HOOD PANEL THRU BUFFER TO HYDRAULIC
PIERCING UNIT TO PIERCE FOUR HOOD
EMBLEM HOLES
TRANSFER UNIT J
TRANSFER MECHANISM TO TRANSPORT
HOOD PANEL FROM INVERSION UNIT TO
LOAD STATION OF PRESS WELDER
HYDRAULIC PIERCING UNIT J-1
HYDRAULIC PIERCING UNIT TO PIERCE
FOUR HOOD PANEL EMBLEM HOLES
TURNOVER UNIT H
TURNOVER UNIT TO INVERT HOOD
PANEL 180 DEGREES AND DEPOSIT
INTO TRANSFER UNIT J AHEAD OF
PRESS WELDER
ON ELECTRICAL
PANEL



The basic transfer unit can be readily adapted to achieve a change in attitude of panel being transferred. A panel is shown here being automatically turned over as it is advanced from the draw press to the trim press.

panel is moved into the third press, also a Clearing, and deposited on lifters in the die for flanging the sides and the rear of the previously-trimmed panel.

Panels in all stations of course are moved concurrently and progress on through the line. In the next press, a Verson, the front of the panel is flanged and the sides are pierced. And in the last press, also a Verson, the sides of the panel are reflanged and the front is flanged under by means of cam-operated die motion.

During the drawing and forming operations, the nose or leading edge of the panel becomes scuffed and it is necessary to remove these imperfections by buffing. Therefore, an additional Jacy-Motion unit picks up the panel from the last press and advances it through two idle stations to a cross-transfer arrangement. The panel is now progressively advanced with the front end facing to the side of the line.

The cross-transfer line is made up of essentially the same basic transfer units as employed previously. In the first idle station along this line, two rivet holes in the hood panel grille flange are pierced and dimpled by an auxiliary, self-contained Jacy hydraulic pierce unit suitably mounted on the side of the transfer unit. At three succeeding idle stations, outboard pedestal-mounted Acme abrasive belt polishing units are employed for finishing of the panel.

The panel is then transferred into a corner station, ready for another change in transfer direction. But first, four emblem mounting holes are pierced using a Jacy hydraulic piercing unit mounted to the end of the transfer unit.

Wands equipped with electromagnets pick up the panel from above and invert or turn it over, depositing it into an idle station. From here it is advanced through another idle station and into a press welder (not shown), where hood reinforcements are assembled in place. The panel is then unloaded from the welder and again inverted into position for inspection and polishing, for final proof of the panel before it is shipped.

Automatic Control

Supplied by Modern Engineering Service with this line of automation is a master electric control cabinet and two pulpit-type central control stations — one at each end of the line. Thus, from either of two vantage points, the operator has full control of the entire line. However, emergency control is available at any press or at any of the transfer units so that should the operator monitoring the line detect anything amiss, he can take over or stop a particular operation locally.

All wiring between control cabinet, control stations, presses, and automation units is carried through the floor. By means of multipin "AN" fast-connect electrical connectors, a single cable for each of the transfer units brings in the multiple leads needed for that unit. The cable can be quickly connected or disconnected to permit moving the transfer unit to facilitate setup or maintenance. In the case of auxiliary operations performed on a transfer unit, a second cable leads to the unit.

Press Die Requirements

With automation, each die becomes an integral part of the system, and any automatic feature within the die becomes an integral part of the entire system. The dies are still basically of the same conventional types, but some modifications are required.

The die must permit the workpiece to be loaded by a straight-line vertical motion. Positive location of the workpiece must be provided for. Location cannot be entrusted to gravity.

Work lifters that function after the press operation and elevate the workpiece to facilitate unloading have become commonplace, but are essential in a fully-automated line. Here the lifters may have to be redesigned so as to hold the panel in a precisely-located position. This

type of line necessitates limit switches to detect whether the lifters are up or down and to automatically stop press or transfer action in the event of a malfunction. Similarly, switches should be provided on other automatic functions within the die.

In general, dies should be built up to uniform height, i.e., when set up in the press, the height at which a workpiece is picked up by the transfer mechanism should be approximately the same as that when it is nested in the next die. Compensation for slight height variation is inherent in the transfer unit. Variations of somewhat greater magnitude can be provided for, but with greater difficulty.

When Modern engineers make their initial study of an existent press line, preparatory to automating it, one of their first acts is to determine a line of levels and what changes may be necessary in press location and bed height to assure proper alignment.

The press for the initial-draw usually is of different character than the first back-up press for trimming the flange. It usually has a longer stroke, greater shut height, and lower bed. But, because the drawn workpiece must be inverted for presentation in the correct attitude to the trim die, a greater height variation here can be taken up in the turnover mechanism itself. The turnover wands can pick up the piece at one level and deposit it on idle-station locators at a higher level.

The attitude in which the die accepts the workpiece must be the attitude at which the piece is presented to the die by the transfer unit. The work-lifters in each die may be so designed as to help achieve the attitude at which the workpiece will be accepted for the following operation.

The flexible construction of the Jacy-Motion transfer unit permits change in attitude of the workpiece. The blank may be tilted, turned around, or turned over as necessary. Since such changes in attitudes necessitate auxiliary equipment, they should be avoided when possible.

Alignment of Units

The transfer units are properly located between presses by virtue of coordinating brackets. Two machined pads are provided at each end of each unit, and similarly two machined faces are called for on the front and rear of each die. Specially designed brackets are fitted to these machined faces. When transfer units are installed in the line, the brackets are brought together by means of a guide pin and bushing fitted through mating holes in the brackets. The dies are then secured to the press bolsters.

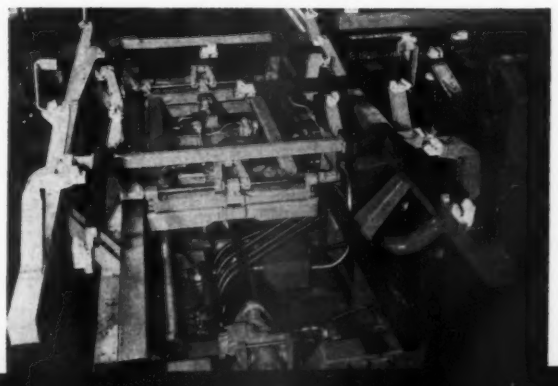
The use of these coordinating brackets permits achievement of a perfect relationship between a transfer unit and the dies at either end. Centerlines, in both horizontal and vertical planes, can be maintained assuring proper indice of the workpiece from press to press. Although presses must be aligned relative to each other, these brackets eliminate any necessity for holding press locations within thousandths.

Portability of Units

Legs on the transfer unit can be elevated or lowered. Built into each leg is an internally-threaded block that is keyed to keep it from turning. A lead screw running down through the block is held from moving vertically by means of a flat rectangular plate secured to the frame. As the lead screw is turned, the leg moves up or down.

The leg has a 12″ range of travel, provided for basic setup in original installation or in changing from one job or press line to another. But, normally, it is only necessary to raise the legs about ¼″ for the weight of the unit to be transferred to the casters.

Assuming that coordinating brackets had already been disengaged and that the AN electrical cables and the air lead had already been disconnected, the transfer unit may now be rolled out of the line. When the unit is returned into position between the presses, the legs are moved down an equal distance to again accept the weight of the unit.



Looking down into a transfer unit showing the fluid-motor driven leadscrew that actuates the carriage on which transfer arms are mounted. On the near end of the unit are keyed face plates for mounting coordinating brackets that establish exact alignment with the adjacent press die.

Changeover Is Simplified

The Jacy-Motion transfer unit can be used on a diversity of products with only minor changes involving one or more of the following: the hydraulic cylinder for the lift mechanism; locator blocks and mounting brackets on the tooling rails; the tooling rails; the coordinating brackets; and electrical controls.

If your product is subject to relatively slight change, as from one model year to the next, careful planning of the press dies will keep overall changes to the minimum. If possible, the new press tooling should process the part in the same sequence of operations and perform each operation with the workpiece in essentially the same attitude as before. This would permit using the same length of indice, and presentation of the workpiece at the same height and in the same attitude as before.

Under these ideal conditions, it is probable that contour changes would necessitate the fabrication of new locator blocks and possibly some new mounting brackets. Relocation of the existent mounting brackets would be sufficient in some instances.

More extensive changes in the product might necessitate redesign of the transfer rails and possibly the idle rails.

The transfer unit moves a stamping from one operation to the next by a series of indices. The unit is so designed as to permit any indice from zero to 94". For instance the unit with an 84" indice is used on the hood panel line previously described, and in the same plant an identical unit, with different tooling and with a 60" indice, is used on a fender skirt line.

Such a radical change, as from hood panels to fender skirts, would mean a complete reappraisal of the line, the design and use of new coordinating brackets, and the change to a hydraulic cylinder of different stroke length. Normally, a press line would be restricted to product parts of similar character.

The fender skirt line mentioned above will run both left hand and right hand skirts over the same automation. That is, the same transfer units are used with new tooling rails. Once the tooling has been established, the transfer rails are exchanged in about 10 mins, and the idle rails in an additional 10 mins.

Adaptability to Other Operations

The Jacy-Motion lift-and-carry transfer units are equally adaptable to assembly operations, according to G. B. Hallahan of Modern Engineering Service. These units can be loading and performing work in between press welders and riveters equally as well as between large stamping presses.

In a press welder, Hallahan pointed out, the platen or bed of the press is normally the moving member and it is very easy to provide a clear channel through the press. Transfer rails could enter the press during the work cycle, and wait for the work to be lowered onto them. Consequently, the increase in production rate for press welders could be considerably better than for large stamping presses.

On one line already automated by Modern, panels are taken automatically through a press welder, with stamping presses both before and after. Hole reinforcements are welded onto the panel and, in the following stamping press, mounting holes are pierced through both the basic panel and the reinforcement.

In many instances, piercing and other operations can be performed between presses without necessitating big machines. An auxiliary piercing unit can be mounted on to the frame of a transfer unit anywhere along the line and perform its operation at what would otherwise be an idle station.

Speeding Up a Production Line

Modern engineers are confident that, as experience with this type of automation is gained in a particular plant, a line can be speeded up considerably over the rate achieved at the time the equipment is installed.

The actual index of a panel accounts for the smallest portion of the total cycle time. Beyond a certain point, to speed up index time it would be necessary to provide tooling holes in the panel or otherwise provide for holding onto the part while in motion so as to not lose location.

The greatest possibility for speeding up the entire cycle, say Modern engineers, is in anticipating the clearance in a press and to so time the action of the transfer unit that the transfer arms are already in motion as the ram rises. Likewise, the downstroke of the ram can begin while the arms that have just loaded a panel into the die are being retracted. With human operators, anticipation of action could not be made use of because of the safety hazards.

At this point it becomes apparent that the critical or bottleneck operation is the drawing operation, where a double-action press is required.

The Danly double-action press, which is the first in the hood panel line, features the Dynamatic drive. This is an Eaton eddy-current clutch-brake arrangement and has the advantage of accelerated punch motion. By that, as the punch is approaching the workpiece, it can be accelerated beyond its normal rate

by being literally dropping towards the work, the brake being applied just before the punch hits metal. From there on, the speed is under control and, at the end of the stroke, the punch can be rapidly withdrawn.

This principle will be employed more and more to greater advantage in pressworking, predicts Hallahan of Modern Engineering Service. He claims that the Dynamatic drive would lend itself to a system that eventually would be servo-controlled.

"By that, I mean that in the future, as automation progresses, it is going to be possible," said Hallahan, "to run all presses on the hop, and at considerable increases in productivity. To assure timing from one press to another, in order that nothing becomes out of phase, it will be desirable to have an electronic servo system controlling the crank or eccentric relationship from press to press."

In future production planning, there will be a more prevalent practice of classifying panels so that a press line, if required to do more than one job, will produce only work of a similar character. This would mean that the first draw press could be designed for the ram's advancement to very closely pursue the blankholder's downward travel, and for the total dwell time to be as short as possible.

Hallahan believes that, with the complete elimination of hand loading and unloading, and with anticipation of actions, the press eventually will be a continually cycling type rather than an intermittent-action type.

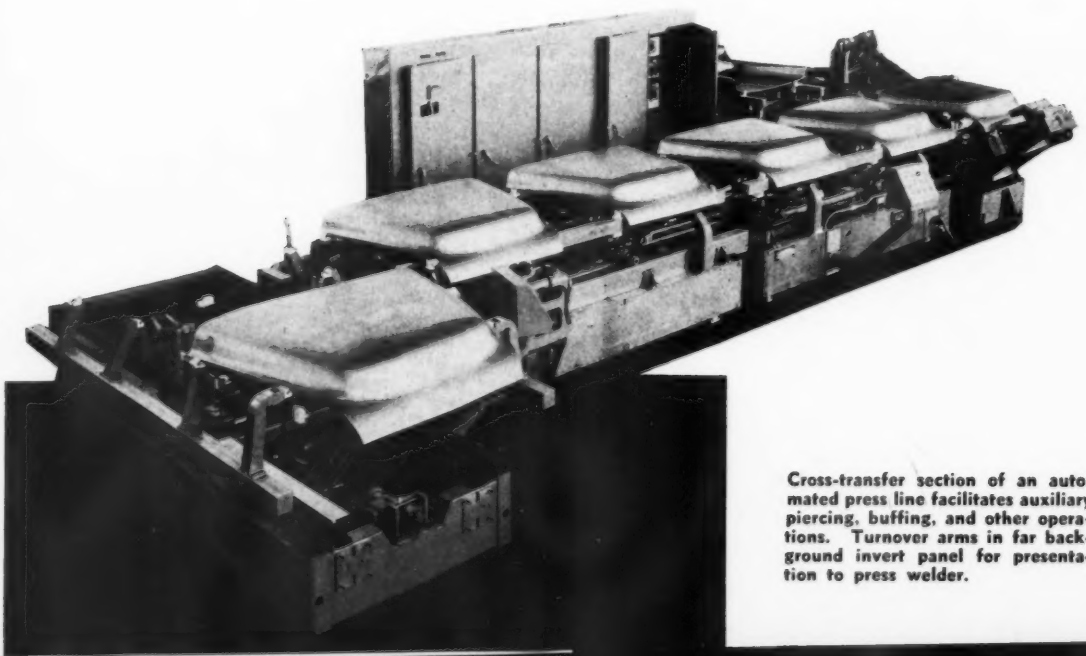
Planning for the Future

The development of a fully-integrated line means that those who seek the full benefits of such technological progress should enter into a program of training personnel to utilize, operate, and maintain this highly-advanced type of equipment.

But, for many plants, existent facilities or equipment must be utilized. It is important for them also to think in terms of a fully-integrated line even though compromises must be made. Presses to constitute a straight-line flow system must be aligned both vertically and horizontally, and be equally spaced so as to accommodate a single-size, standard transfer unit with a uniform increment of travel throughout. Relocation of present equipment may be necessary to achieve this.

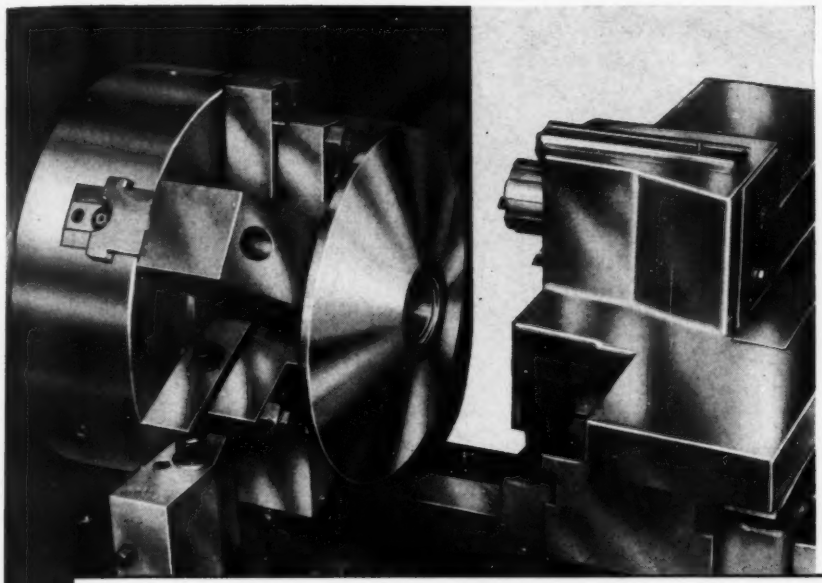
In planning a new plant or remodeling existing facilities, it's desirable to provide a clear channel for a raceway in the floor, adjacent to the press line. Most large presses are pit mounted anyway. This provision permits running all wiring through a duct rather than in conduit and facilitates service or maintenance or changeover at some later date. Any wiring above the floor in a large stamping plant would be in the way of the overhead crane.

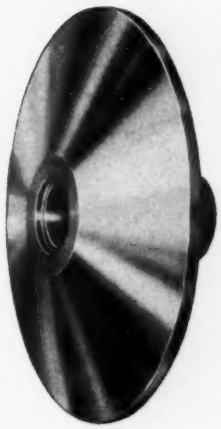
Design of dies and other press tooling should be done concurrently with that of the automation units and interlocking control system for the entire line, and should be the responsibility of one coordinating person or agency.



Cross-transfer section of an automated press line facilitates auxiliary piercing, buffing, and other operations. Turnover arms in far background invert panel for presentation to press welder.

ARE YOU REALLY POWERED FOR PRODUCTION?





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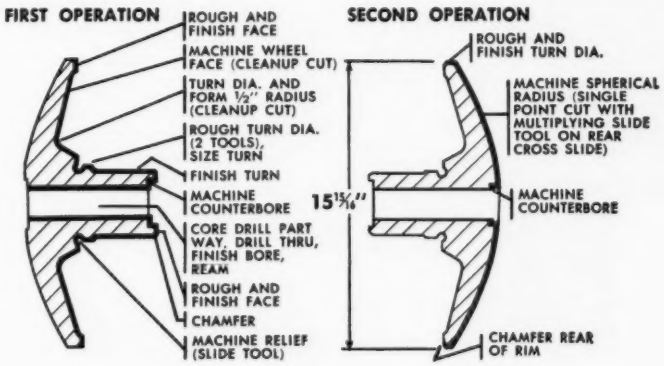
FIRST OPERATION
ROUGH AND FINISH FACE
MACHINE WHEEL FACE (CLEANUP CUT)
TURN DIA. AND FORM ½" RADIUS (CLEANUP CUT)
ROUGH TURN DIA. (2 TOOLS), SIZE TURN
FINISH TURN
MACHINE COUNTERBORE
CORE DRILL PART WAY, DRILL THRU, FINISH BORE, REAM
ROUGH AND FINISH FACE
CHAMFER
MACHINE RELIEF (SLIDE TOOL)
SECOND OPERATION
ROUGH AND FINISH TURN DIA.
MACHINE SPHERICAL RADIUS (SINGLE POINT CUT WITH MULTIPLYING SLIDE TOOL ON REAR CROSS SLIDE)
MACHINE COUNTERBORE
15 15/16"
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ANOTHER EXAMPLE of

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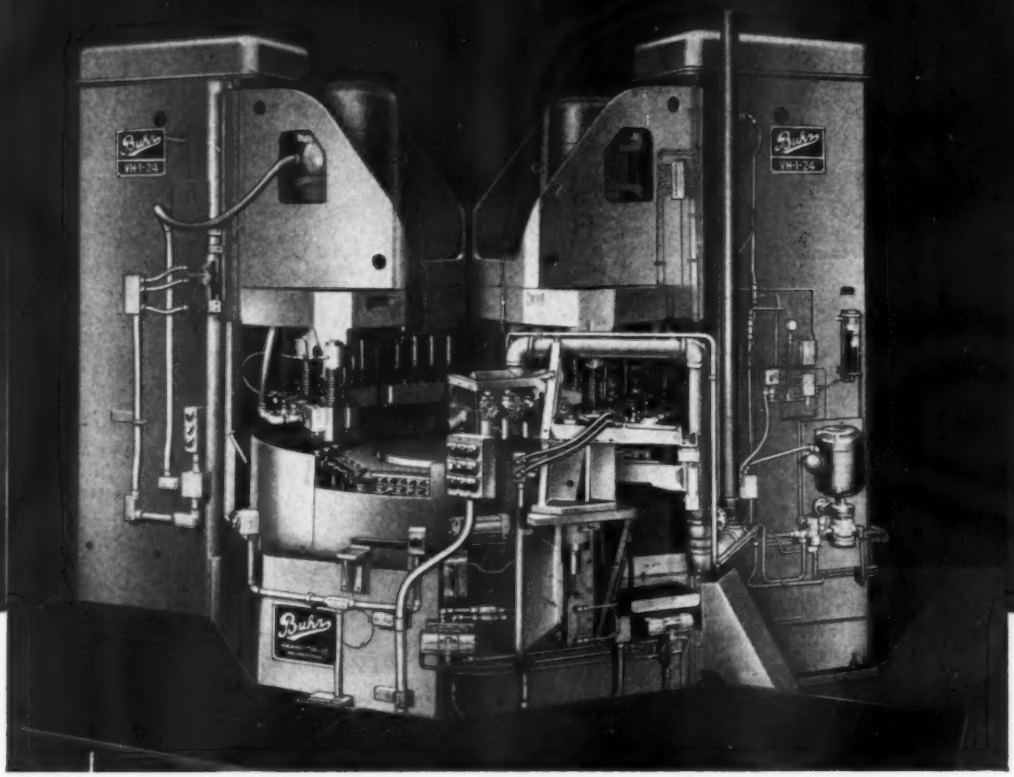
Drills, chamfers and reams wrist-pin holes in 543 connecting rods an hour



This 8-station 2-column Buhr Economatic, which features automatic unloading of parts, processes connecting rods in this manner—

Station 1—load 4 parts . . . Station 2—drill (4) 55/64″-wrist-pin holes 1/3 through . . . Station 3—drill (4) 27/32″-holes 2/3 through . . . Station 4—drill (4) 53/64″-holes through . . . Station 5—coredrill (4) 31/32″-holes through . . . Station 6—20°-chamfer both ends of (4) holes . . . Station 7—1.001″-ream through (4) holes . . . Station 8—unload parts automatically onto conveyor.

Besides automatic unloading, this Buhr Economatic features a 72″-diameter Buhr Powerflo index table, and automatic clamping and chip removal.

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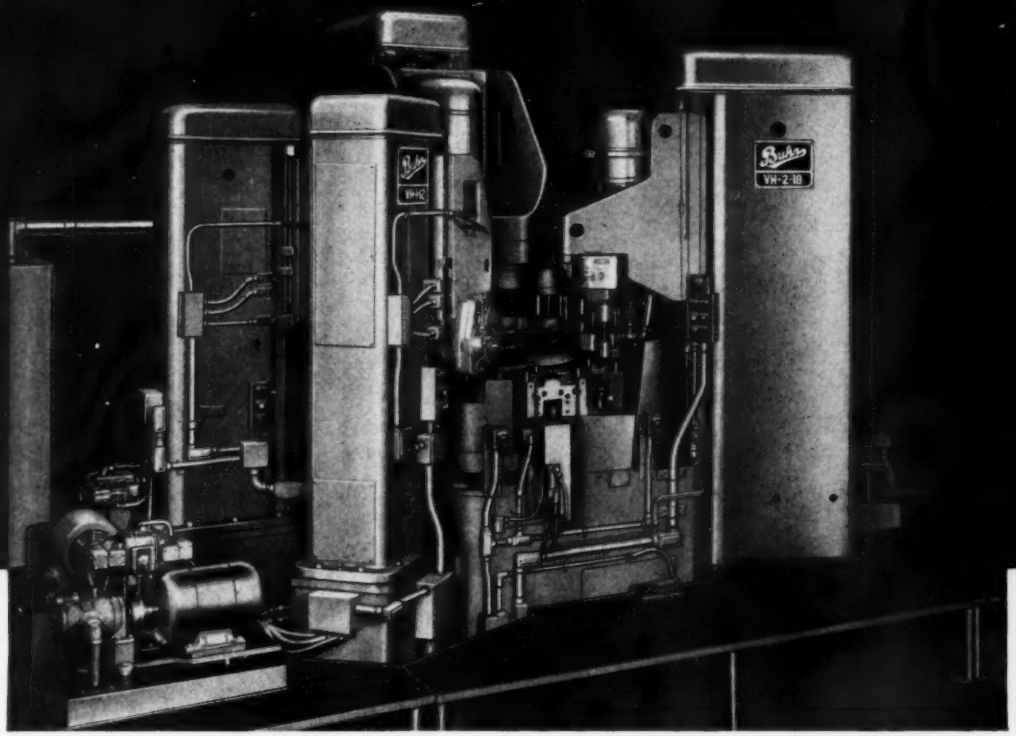
Drills, chamfers and reams (2) bolt holes, and mills and chamfers bearing notches in 600 connecting rods an hour



This 8-station 4-column Buhr Economatic, featuring two angular mill units, performs operations on connecting rods as follows—

Station 1—load and unload 4 parts . . . Station 2—mill bearing notch in (4) parts . . . Station 3—chamfer bearing notch in (4) parts . . . Station 4—drill (8) $^{33}/_{64}$″-holes 1/2 through . . . Station 5—chamfer (8) holes . . . Station 6—drill (8) $^{33}/_{64}$″-holes through . . . Station 7—rough-ream (8) $^{3}/_{8}$″-holes . . . Station 8— finish-ream (8) .390″-holes.

Features of this Buhr Economatic, other than the two angular mill units, include a 60″-diameter Buhr Powerflo index table, automatic clamping and manually-operated part ejector.

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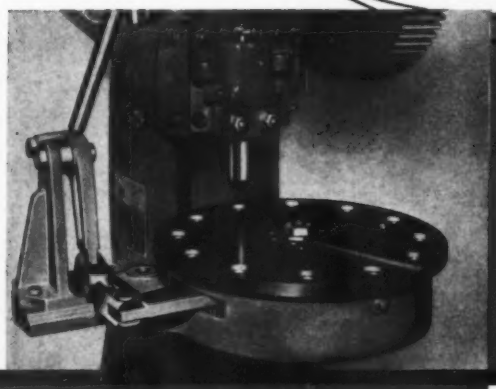

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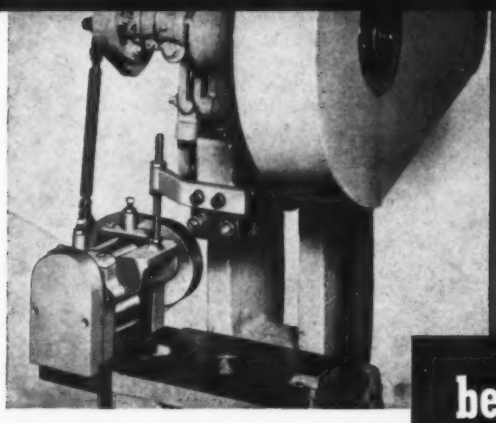

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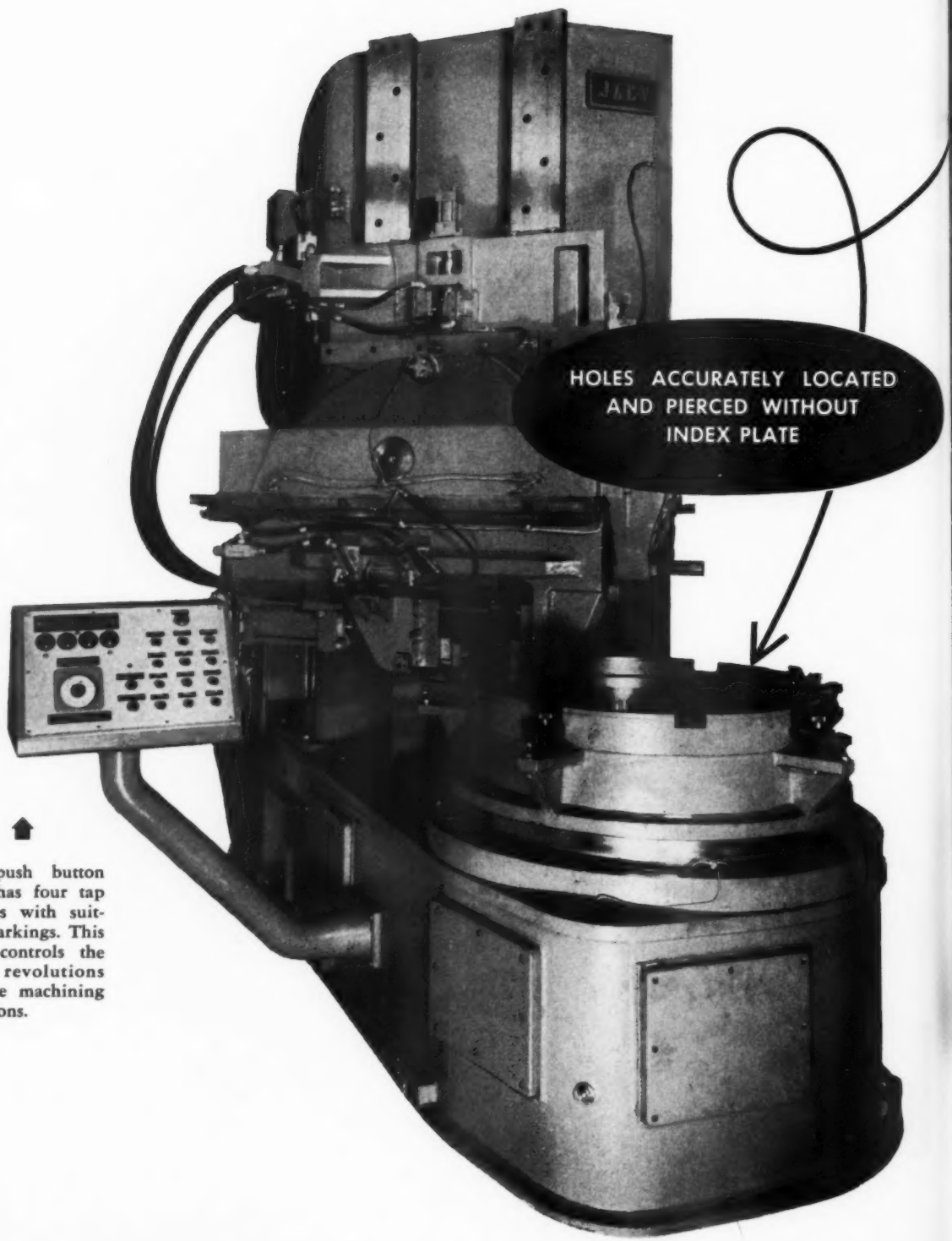
The NEW JACY Shroud



This push button panel has four tap switches with suitable markings. This panel controls the table revolutions and the machining operations.

Piercing Machine by Modern... pioneers of the JACY-MOTION illustrated in this month's feature article

This new JACY automatic shroud piercing machine pierces pressed, forged and machined metal parts. Versatility of operation, quick changeover from one set-up to another and the elimination of index plates make this machine tool unique in the metalworking field as a time saver and a reducer of tooling costs.

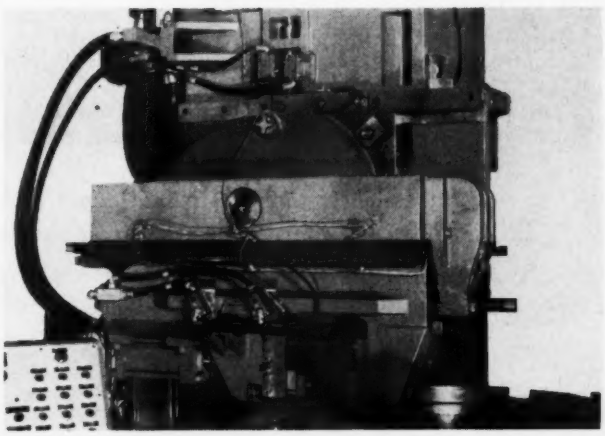
This new JACY product, developed by Modern Engineering Service Co., is applicable to all piercing and many drilling operations on annular metal forms for jet engines, missiles and air frames. Accuracy of hole location is controlled on the 44" diameter to within .001".

The clamping and locking operations are controlled by hydraulic actuation. Electronic counter and computer mechanisms control the rotation of the work table to the desired number of revolutions and/or the number of degrees in each index.

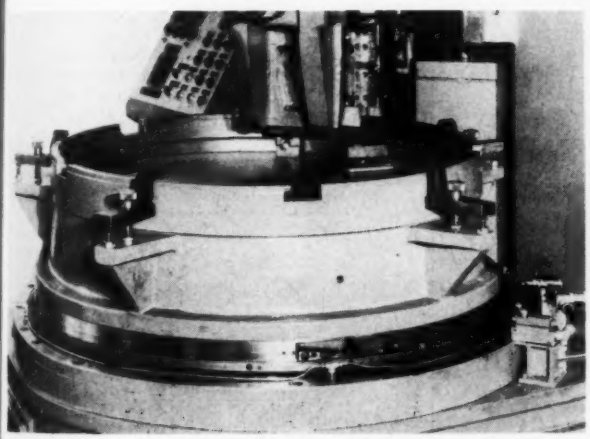
This JACY machine tool was designed and built by Modern Engineering Service Co. to do automatically a specific job better and faster. Other JACY automatic machines are now successfully speeding production and saving man hours.

The JACY automatic principle, built into this machine, is so versatile that it can be applied to drilling, reaming, milling, boring. threading and similar machining operations . . . ideal for both short and long production runs.

When you are looking for ways and means of getting the jump on competition or cutting tooling costs, consult with Modern Engineering.



Holes can be pierced up to 15° off horizontal in both directions by the piercing head which tilts. This head moves vertically and will handle work pieces up to 20" in depth. There is an additional retraction of 20" which permits easy removal of work pieces.



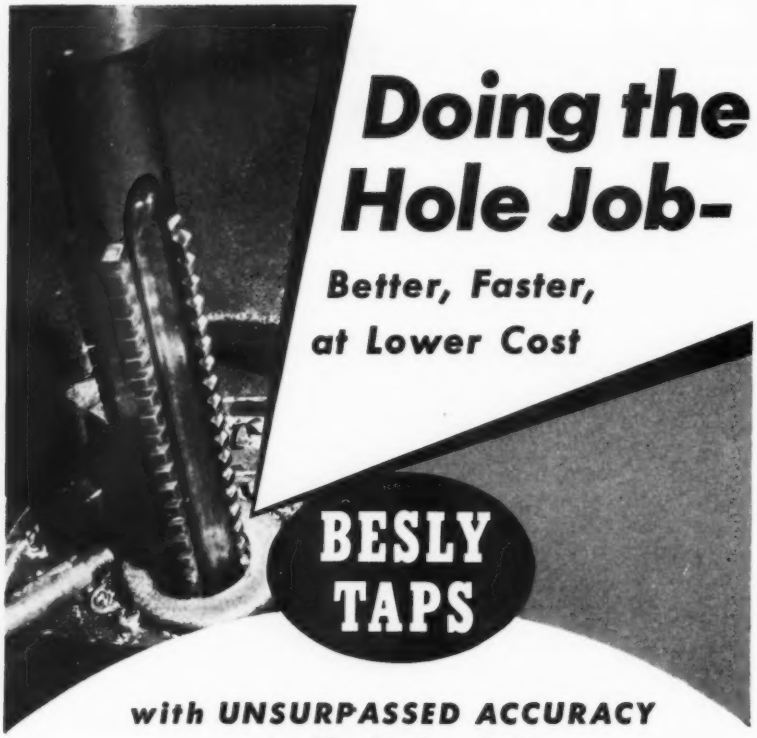
The work table has a capacity for work pieces 16" to 44" in diameter and up to 20" in depth. This is possible because the piercing head is adjustable inward or outward radially.

Modern has complete engineering facilities and will design and build automation equipment and special machines tailored to your needs.

MODERN ENGINEERING SERVICE CO.

1695 TWELVE MI. ROAD, BERKLEY, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 931



Doing the Hole Job-

Better, Faster, at Lower Cost

BESLY TAPS

with UNSURPASSED ACCURACY at all vital points

Tru-Square DRIVER | Mirror-Finish FLUTES | Solid Ground THREAD FORM | Accurate RAKE ANGLE | Microcentric CHAMFER

You get better threaded parts, longer tap life and lower tapping costs when you use Besly Taps in your shop. The correct tap design plus Besly's unsurpassed accuracy, make the difference, both in production quality and costs.

PUT BESLY ON TRIAL . . .

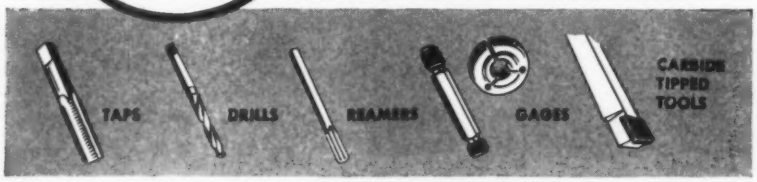
ask your Besly Distributor to put the right Besly Tap on your toughest job. There's no cost or obligation to actually see what Besly taps can do for you. When you call him, be sure to get the details on Besly's Super-Service on "specials".

BESLY

BESLY-WELLES CORPORATION

Established as Charles H. Besly & Co. in 1875

128 Dearborn Avenue • Beloit, Wisconsin



CIRCLE INFORM-A-GRAM KEY NO. 941

How to Cut Costs on Special Steel Die Sets

by Phil Marsilius

THE PRODUCTO MACHINE CO.
Bridgeport, Conn.

WHILE THE FOLLOWING RECOMMENDATIONS may seem elementary to the designer and user of die sets, we bring them to your attention because each year we see literally hundreds of prints where one or more of these suggestions could have cut costs and shortened delivery time. In 90% of the cases where we had sufficient time to ask the customer if one of these alternates could be used, we were advised to proceed according to our recommendations.

1. On rectangular or circular plates for die holders, punch holders, strippers, bolsters, etc., if overall dimensions do not have decimal tolerances, and a machined appearance is not essential, a clean-looking job at lowest cost can be obtained by flame-cutting.

Fig. 1. Flame-cut edges?

2. Where cutouts are required for drop-out holes, bolt slots, clearance or other purposes, and tolerances on dimensions are fractional, the fastest, most economical method to use is flame-cutting.

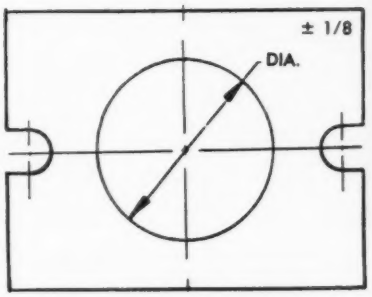
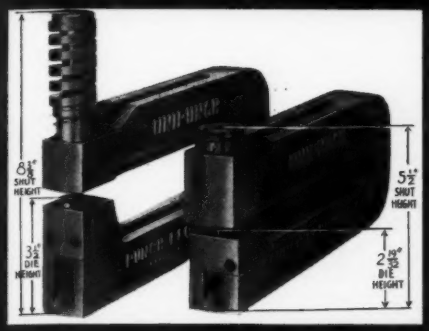


Fig. 2. Flame-cut hole and slots?

3. However, if appearance is an important factor and the fine "rippled" edge left by flame-cutting would not be satisfactory, in many cases edges, drop-out holes and slots can be saw-cut to give a machined look at lower cost.

. . . *Continued on page 98*

Announcing UNIPUNCH



CUSTOMER POLICY

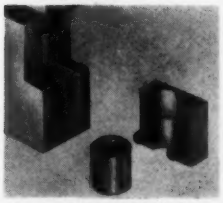
By maintaining a complete stock of units, punches, dies and parts backed by an experienced CUSTOMER SERVICE DEPARTMENT, customers are assured of QUICK DELIVERY. Off-standard units and requests for quotations receive immediate attention. Complete engineering service, too, on Unitized Tooling.

UNIPUNCH

PATENT RIGHTS RESERVED

Exploded view of two-piece punch that permits head to be used and reused on inexpensive punch bodies. An advantageous saving.

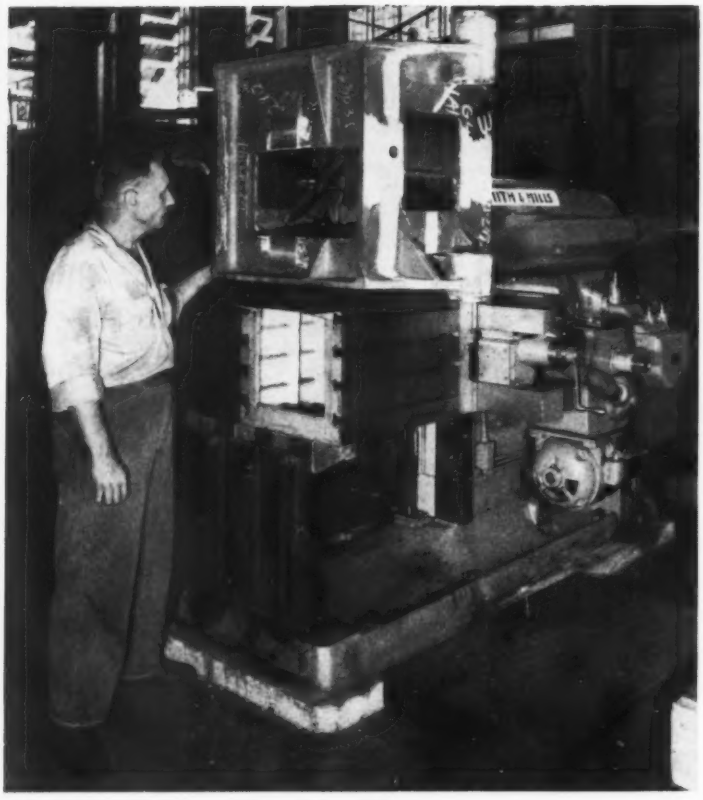
Showing economical snap-on stripper that eliminates individual guides for each size punch tip. Another economy built into Unipunch Perforating Units.



Inexpensive button die lowers cost. Die clamp in front permits quick interchanging of dies without disturbing unit or setup.

PUNCH PRODUCTS
Corporation
3804 Highland Avenue, Niagara Falls, N. Y.
Manufacturers of UNITIZED Hole-Punching and Notching Equipment

CIRCLE INFORM-A-GRAM KEY NO. 951



SMITH &

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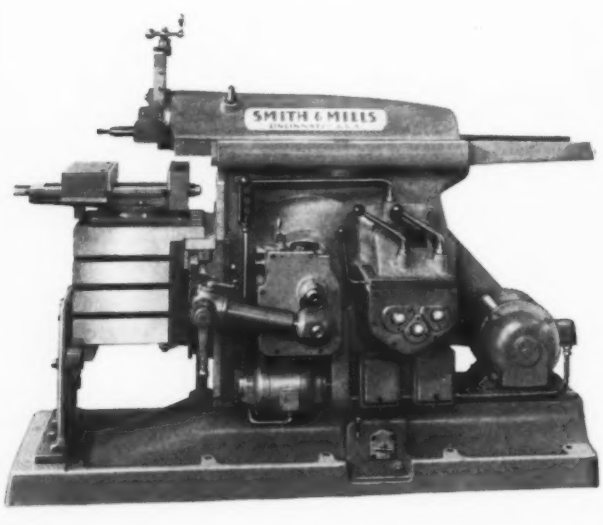
manufactured s

QUALITY SHAPERS

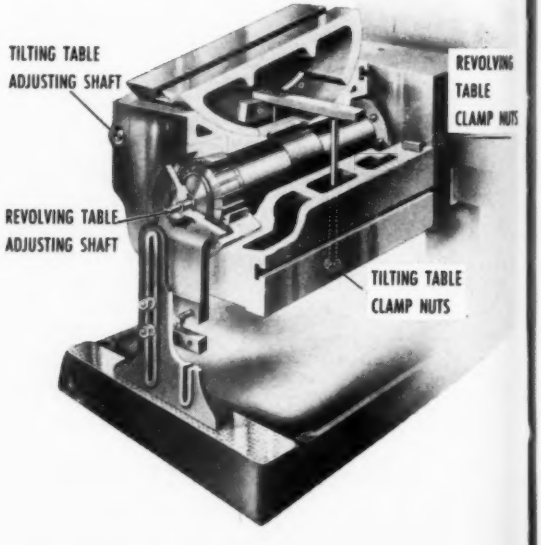
Smith & Mills shapers have been recently redesigned and improved. The engineering, quality control and manufacturing supervision to which they will be subjected assure you of continued high quality.

PROMPT SERVICE

The large Cincinnati plant in which Smith & Mills shapers are now being built—is equipped with modern equipment and staffed with skilled machinists and assembly technicians . . . offering prompt service.



STANDARD MODEL—Plain Table



UNIVERSAL TABLE

& MILLS SHAPERS

IN CINCINNATI...

sold and serviced by Nebel Machine Tool Corp.

Smith & Mills shapers—one of the oldest and best known—are now being built in Cincinnati under the engineering and manufacturing supervision of the Nebel Machine Tool Corp., one of the most respected machine tool builders.

This association of Smith & Mills with Nebel assures quality shapers, prompt shipments and dependable service for Smith & Mills customers past, present and future.

Nebel's staff is being enlarged by the addition of key Smith & Mills engineering and management personnel.

The plant and equipment in which Smith & Mills shapers are now being built is large, modern and equipped to produce quality machine tools.

Smith & Mills shapers are available in Heavy Duty Models in 16", 20", 25", 28", 32" and 36" strokes, and Standard Duty Models in 20" and 24" strokes. Smith & Mills shapers can be furnished with plain, universal or revolving tables in all sizes.

Inquiries for Smith & Mills shapers, repair parts and service should be directed to the address shown below.

The tradition established by Smith & Mills in 1888 as manufacturers of fine shapers will be continued and expanded under the new ownership and management.

Write us today for complete information including prices and delivery.

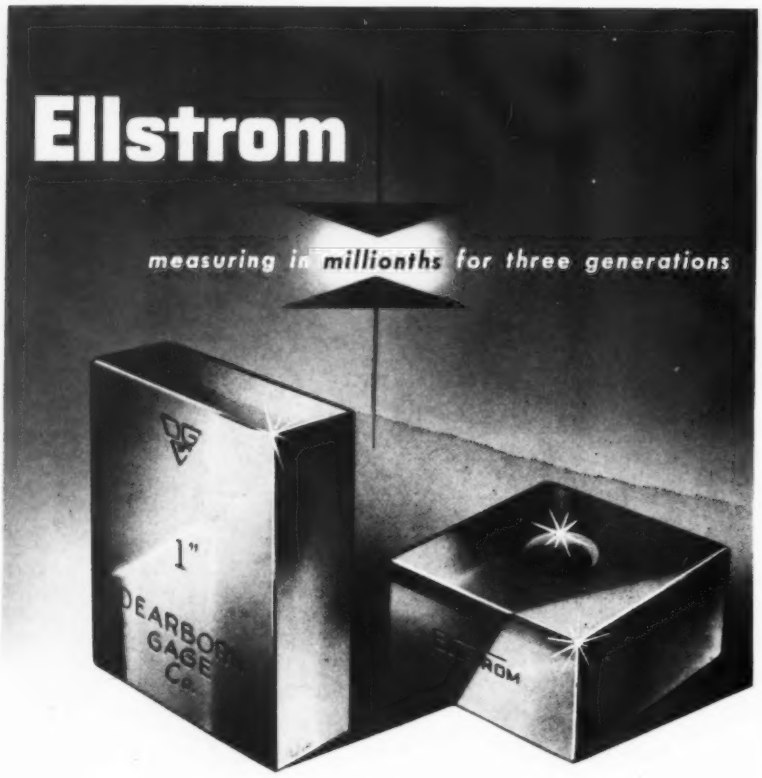
PLAIN TABLE AND UNIVERSAL TABLE MACHINES

SIZE OF MACHINES	16" HVY.	20" STD.	20" HVY.	24" STD.	25" HVY.	28" HVY.	32" HVY.	36" HVY.
RAM Extreme Length of Stroke Strokes per Minute Speeds Ram Bearing in Column	17" 11-149 8 33½"x10½"	21" 11-149 8 33½"x10½"	21" 10-133 8 38"x11½"	25" 10-133 8 38"x11½"	26" 8-114 8 43"x12½"	29" 8-114 8 43"x12½"	33" 8-106 12 48"x13½"	37" 8-106 12 48"x13½"
TOOL HEAD Vertical Travel Size of Tools	* 7" ⅛x1¼"		* 8" ⅛x1¼"		** 8½" 1"x2"		** 9" 1"x2"	
FEEDS No. of Feeds Feed Range	10 .010" to .100"		15 .010" to .150"		15 .010" to .150"		15 .010" to .150"	
VISE-SINGLE SCREW Size of Jaws Opening	12"x2½" 13½"		13"x3" 16"		13"x3" 16"		15"x3½" 16½"	
MOTOR DRIVE Speed of Drive Shaft Motor Horsepower 1800 R.P.M. constant	350 R.P.M. 3-5		350 R.P.M. 5-7½		350 R.P.M. 7½-10		425 R.P.M. 10	

Smith AND Mills SHAPERS CINCINNATI

SMITH & MILLS SHAPER DIV.
NEBEL MACHINE TOOL CORP.
3401 CENTRAL PARKWAY
CINCINNATI 25, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 971



Here are GAGE BLOCKS that invite your most critical inspection!

WE'RE "fussy" about the gage blocks we make. And we hope, when *you* buy a set, that you'll be fussy, too. Because only by your own critical, impartial inspection of each individual block can you come to appreciate the true full measure of quality, value, and dependability inherent in Ellstrom Chromium Plated Standards.

Yes, we'd like you to check any set of Ellstrom gage blocks that meets your particular inspection or production requirements. Check them block-by-block for size . . . for their consistent adherence to closer than specified accuracy. For flatness . . . parallelism . . . and the finish of their hard, uniform chromium plated gaging surfaces that give you greater serviceability, longer wearing millionths. And, too, test the fine materials used in their manufacture . . . for coefficient of expansion and controlled metallurgical stability. Then, we're sure, you'll agree that it pays to standardize on Ellstrom Standards.

IF YOU BUY GAGE BLOCKS, send for your free copy of this new Ellstrom Standards Catalog. Contains complete specifications and prices on the entire Ellstrom line of gage block sets, accessories, individual blocks, wear blocks, inspection service and trade-in plan. Write today!

ELLSTROM STANDARDS DIVISION
Dearborn Gage Company • 22035 Beech Street • Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

CIRCLE INFORM-A-GRAM KEY NO. 981

. . . Cut Costs from Page 94

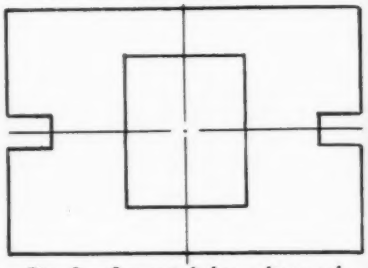


Fig. 3. Saw-cut holes, edges and slots?

4. Large radii cut costs. Small radii of machined slot (left side) necessitate use of a small-diameter cutter, increasing number of cuts required, and reducing cutter speed and feed. Large radii (right side) reduce cutting time by more than half.

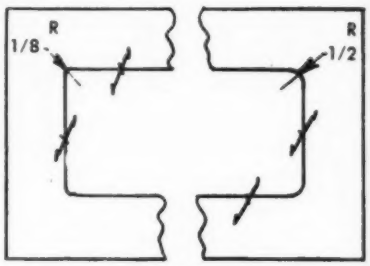


Fig. 4. Small or large radii?

5. Liberal hole location tolerances keep machining time down and keep your order from being held up at precision machines usually working under heavy load.

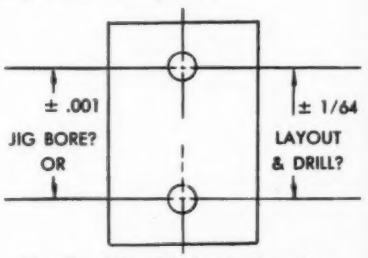


Fig. 5. Liberal hole location tolerances?

6. Pin or bushing supports in order of cost (high to low): a. Machined from solid; b. Screwed and doweled; c. Welded. Welded supports, in addition to being lowest in cost, require much less time for fabrication, help to speed up delivery.

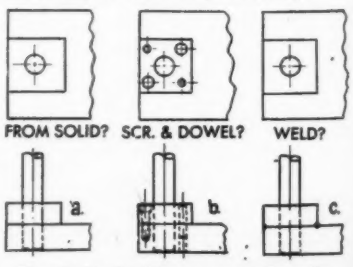


Fig. 6. Pin bushing supports in order of cost (high to low)

7. Bolt slots in hold-down pads or flanges can be flame-cut at the same time plates are being cut to size, thereby saving time and eliminating cost of an extra machining operation.

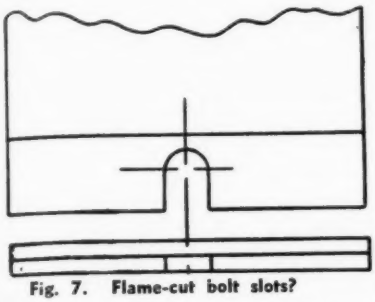


Fig. 7. Flame-cut bolt slots?

8. When machining of bolt slots is a "must" and a square slot with small corner radii is not essential, a single radius slot is cheaper and faster.

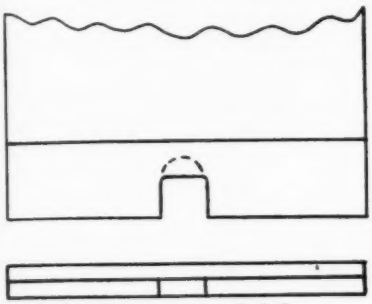


Fig. 8. Square or round slot?

9. Try to use catalog pins and bushings. There are comparatively few cases where selection of the right pin and bushing cannot be made directly from the catalog. Special dimensions always mean higher cost and longer delivery.

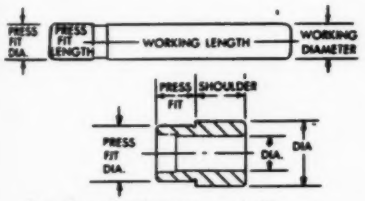
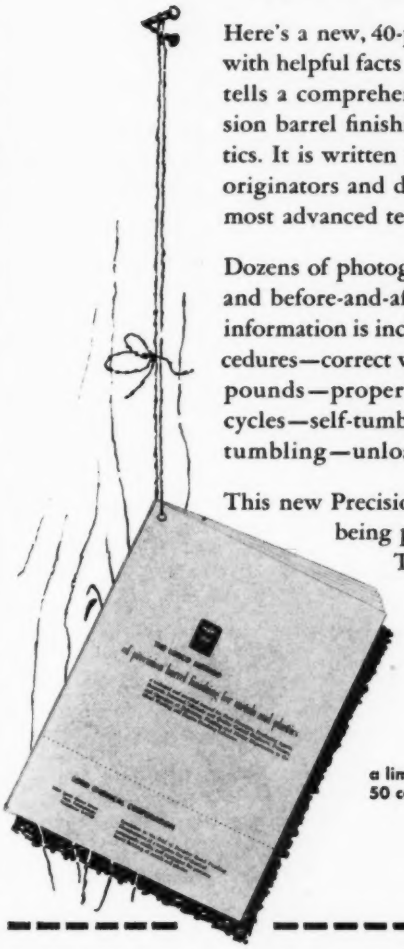


Fig. 9. Catalog or special?

Finally, we suggest that you always review your specifications and ask, "Will one of these alternates do the job as well?" Each "yes" is money saved!

JOIN THE MARCH OF DIMES JAN. 3 to 31

A NEW, COMPREHENSIVE MANUAL OF THE LATEST TECHNIQUES FOR PRECISION BARREL FINISHING METALS and PLASTICS



Here's a new, 40-page, practical guide . . . filled with helpful facts and processing data . . . which tells a comprehensive story of modern precision barrel finishing for both metals and plastics. It is written in step-by-step fashion by the originators and developers of many of today's most advanced techniques.

Dozens of photographs show actual operations and before-and-after parts. A fund of valuable information is included on: proper loading procedures—correct water levels—selection of compounds—proper media types and sizes—time cycles—self-tumbling—free tumbling—fixture tumbling—unloading and drying of parts.

This new Precision Barrel Finishing manual is being published as a limited edition. The price is 50 cents per copy. To obtain yours, please mail coupon below.

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CIRCLE INFORM-A-GRAM KEY NO. 991

Guarantee ***TOP*** *Performance and Maximum Life!*

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify
CASE HARDENED CHROME PLATED PISTON RODS
On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify
"TEFLON" WIPERS
On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

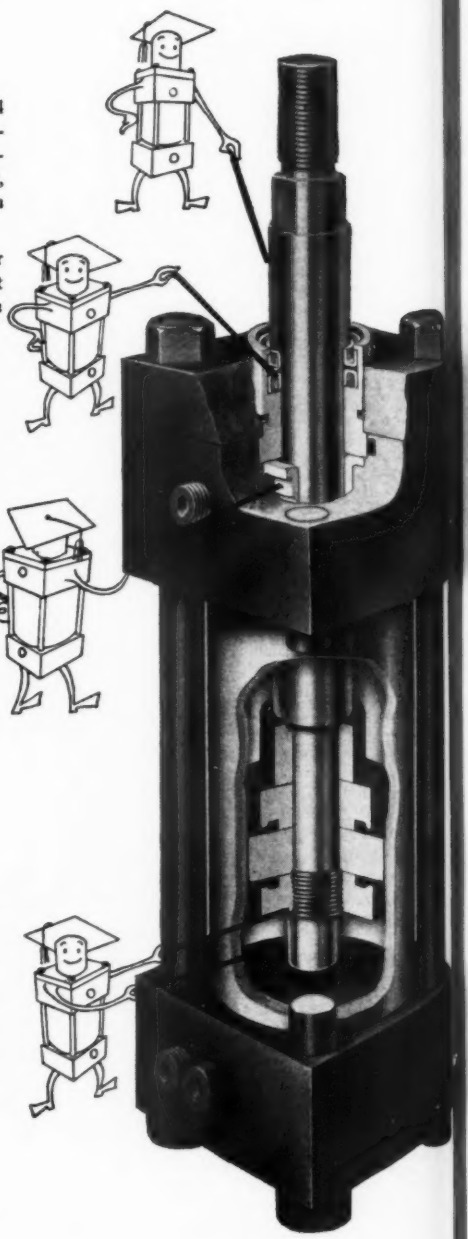
Specify
TEFLON HYDRAULIC ROD SEALS
On all Hydraulic Cylinders

Specify
RUST RESISTANT SURFACES
On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.)_____

"On all our future cylinder requirements, please specify the above quality features."

Signed_____

Title_____

EFFECTIVE DATES

These new Miller features will be provided at no extra cost after January 1, 1956—and at Miller's option prior to that date.

SALES AND SERVICE FROM COAST TO COAST

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Miller

MILLER FLUID POWER CO.

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS

In 1945-46 You Benefited . . .

From the following quality cylinder "Firsts" offered by Miller Fluid Power Company on its standard catalogued power cylinders:

☐ 1. Square bar steel heads, caps, and components
☐ 2. Welded fabricated steel mountings
☐ 3. Detachable, interchangeable steel mountings
☐ 4. High tensile steel tie rods (4 per cylinder)
☐ 5. High tensile steel piston rods
☐ 6. Chrome Plated Piston rods
☐ 7. Wrench flats on piston rods
☐ 8. Non-corrosive tubing on large bore air cylinders
☐ 9. Step-cut piston rings on hydraulic cylinders
☐ 10. Dirt wipers on air cylinders
☐ 11. Dirt wipers and oil wipers on hydraulic cylinders
☐ 12. Non-adjustable, bubble-tight, leakproof piston rod seals on air cylinders
☐ 13. Non-adjustable, bubble-tight, leakproof piston seals on air cylinders
☐ 14. Non-adjustable, leakproof, hydraulic piston rod seals guaranteed not to leak even one drop of oil
☐ 15. Non-adjustable, leakproof, hydraulic piston seals guaranteed not to leak even one drop of oil
☐ 16. 98% plus operating efficiency on air cylinders of 4" and larger bores at 80 psi
☐ 17. 98% plus operating efficiency on hydraulic cylinders of 4" and larger bores at 130 psi
☐ 18. 1 psi no-load break loose pressure on air cylinders of 3¼" bore and larger
☐ 19. 3 psi no-load break-loose pressure on hydraulic cylinders of 4" bore and larger
☐ 20. Seal life in excess of several hundred million feet of piston rod travel on all of the above-mentioned piston seals
☐ 21. Precision-seal cylinders
☐ 22. Seals that seal with pressure on all hydraulic static seals
☐ 23. Catalogued line of hydraulic cylinders of 2000 to 3000 psi operating pressure

In 1954 You Benefited again—from Miller's . . .

☐ 24. Sizable stock cylinder program
☐ 25. Model 77 heavy duty detachable foot mountings

In 1955 You Benefited again—from Miller's . . .

☐ 26. Greatly expanded stock cylinder program
☐ 27. Case-hardened, chrome plated piston rods
☐ 28. "Teflon" hydraulic piston rod seals
☐ 29. "Teflon" dirt wipers on air cylinders
☐ 30. "Teflon" dirt and oil wipers on hydraulic cylinders
☐ 31. High quality rust preventive finish on all parts not otherwise protected from rust on both air and hydraulic cylinders

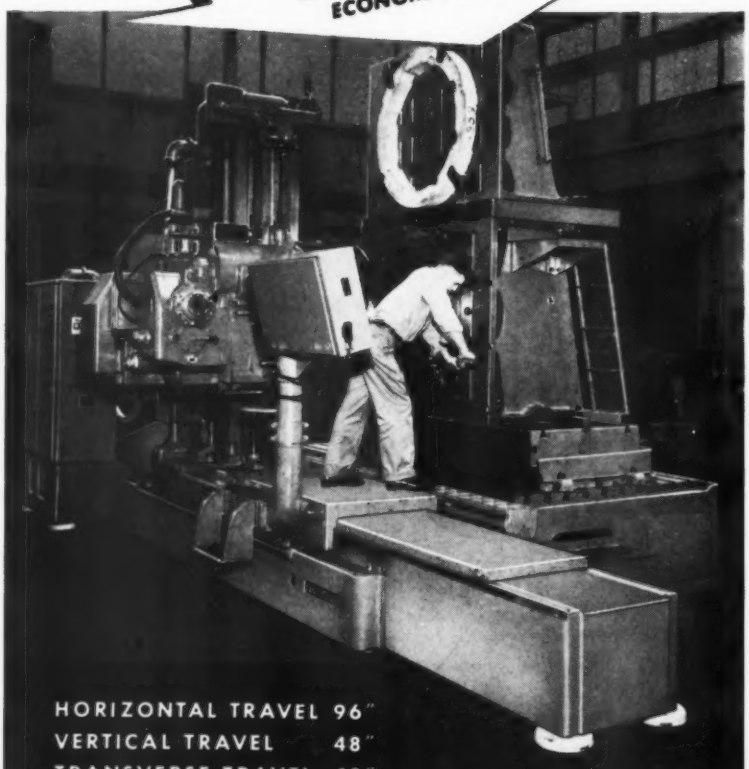
Enter in boxes above the YEAR in which your supplier first (if at all) gave you these benefits.

In 1956, You Will Benefit Again . . .

Watch For MORE Miller Firsts!

BARTH'S BIG, NEW TYPE BG-21 KELLER MACHINE

duplicates
IRREGULAR SHAPES
EXACTLY • SPEEDILY
ECONOMICALLY



MECHANICAL DUPLICATION of large size, irregular shaped dies, molds and production parts that cannot be machined with conventional milling machines, is accomplished speedily and with precision on Barth's big, new Type BG-21 Keller Duplicator.

A model of the part to be duplicated is fastened above the work . . . tracer points, actuated by electrical contacts, operate the contouring movements . . . the milling cutters faithfully follow the same path as the tracer points and exactly duplicate the irregular shape.

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CIRCLE INFORM-A-GRAM KEY NO. 1021

Carbide-Faced Valve Lifters in Mack Engines

Carboloy's newly developed brazing technique for joining cemented carbide to valve lifters has enabled Mack Trucks, Inc., to take advantage of the unique properties of carbide, thereby increasing performance of its valve lifters from 17,000 to 300,000 miles without any appreciable wear.

The carbide-faced lifters also allow use of engines with greater cam loads, Mack reports, resulting in greater power outputs.

The use of carbides for valve lifters in Mack's engines started when the company began to increase the power output of its engines. Increasing the sharpness of engine nose cams and valve spring loads brought about considerable wear and galling on the lifter face. This presented the company with a serious problem since bus and truck engines, unlike pleasure cars, must be kept running for long periods of time. Chilled cast iron lifters sometimes proved erratic in performance.

A carbide disk was developed, with the aid of Carboloy engineers, which met the requirements of Mack's range of engines. The problem of joining grade 779 carbide disks, however, was only recently solved satisfactorily. Today, Mack uses the carbide-faced lifters in its diesel, gasoline, and supercharged diesel engines.

Versatile Dial Indicators Used to Gage Jet Parts

Although dimensional inspection is a necessity for most of the parts of a jet engine, in many cases there is no need for complicated and supersensitive measuring instruments. The dependable accuracy and versatility of the economical dial indicator can be put to very good use on many of the inspection jobs.

Six different points on jet engine compressor blades, for example, are checked simultaneously on a series of multiple dimension dial indicator gages manufactured by Federal Products Corp. of Providence, R. I. They provide ample accuracy with high magnification so the dimensional variations can be read clearly. By checking six points simultaneously, there is sufficient gaging speed to do the necessary inspecting without slowing down production.

FORM-TRUE GRINDING WHEELS

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WHEEL FORMING ATTACHMENTS

FORM COMPLEX PROFILES
TO "TENTHS" ACCURACY
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there's a P&W Diaform RIGHT for Your work!

Team up a lightweight, portable P&W DIAFORM Wheel Forming Attachment with your horizontal spindle surface grinder and true those complex grinding wheel shapes in minutes . . . re-truing the same shapes as often as required . . . produce ***better*** dies, punches, forming tools etc. ***in hours instead of days!***

Operation . . . based on the pantograph principle . . . is very simple, requires no special skill. A tracer is lightly traversed over an inexpensive template; reduction ratios of 10:1 or 5:1 minimize template errors and the form is diamond-trued at the wheel to tenths of a thousandth accuracy.

- **SMALL** – **MODELS AT and BT**
  for truing wheels up to 10" diameter and 1" wide.
- **MEDIUM** – **MODELS 2A and 2B**
  for truing wheels up to 14" diameter and 2" wide.
- **LARGE** – **MODELS 4A and 4B**
  for truing wheels up to 20" diameter and 3" wide.
- **RELIEF GRINDING** – **SERIES "R"**
  eliminates lengthy calculations and trial-and-error methods . . . accurately compensates for rake or relief angles on form cutting tools and provides true form at the cutting edge. Three models accommodate wheels up to 20" diameter and 3" width.

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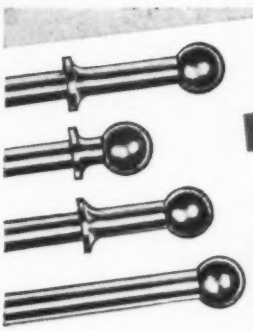

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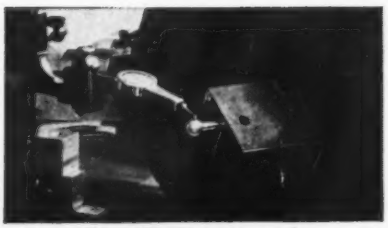

Shown: Checking compound angles with tooling ball mounted in lathe fixture.

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of Tools, Dies, Jigs, Fixtures, Production Parts.

JIG SHOP Fabrication of assembly jigs, master tooling, using transits, sight levels, or jig collinators.

TOOL ROOM Fabrication of jigs and fixtures with critical locations of holes and compound angle surfaces.

Ask for Catalog 55 G.

Shown: Tooling ball take-off units with precision levels which simplifies construction and inspection of tooling, masters, assembly jigs, and major jigs, used primarily in the aircraft industry.

Standard balls available in straight or shoulder shank. Balls attached to shanks with no brazing or welding.

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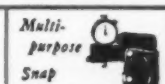
"O" Ring Groove Gages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Special Setting Masters

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Gages for Groove Location and Depth.

PRECISION GAGING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 1041

How to Get the Best Results from Cut-Off Machines

Cutting off ferrous and nonferrous metals can be a costly problem or a big money-saver to industry, depending on the conditions of use and selection of wheels for the work.

Studies by Delta Power Tool Division, Rockwell Manufacturing Company, show that nearly every manufacturer of metal products has a use for the abrasive cut-off machine. Because of its relative newness in many plants, the tool is sometimes misused, say Delta technicians.

Proper use or misuse of the cut-off machine often lies in the choice of wheels. For cutting hard materials a soft grade of wheel is used; hard materials tend to dull the grit more rapidly, while a softer bond tears the grit away to expose sharp grit to the work.

At Calumet Manufacturing Co., Chicago, this Delta abrasive cut-off machine is used on stainless steel angle irons and brass and copper tubing for the Calumet 8 x 10 camera and photographic processing equipment. The saw holds a tolerance of ± 0.002"

The shape of the part to be cut also influences wheel choice. For example, a softer wheel should be used to cut solid stock than is necessary on tubular stock. Tubing presents a small contact area to the wheel and thus higher unit pressure which tends to break down the bond more rapidly.

How to Cut with Abrasive Wheels

In cutting ferrous metal, best results are achieved by feeding the wheel into the work as fast as possible. Feeding pressure should be applied steadily after the wheel is in contact with the work, but not to the extent that the wheel is slowed considerably. The faster the wheel is fed through the work, the greater the wheel life obtained.

Burrs on the work are often a problem in metal-cutting with abrasive wheels. In cutting hard materials burrs present no great problem, and any that do occur are so hard and brittle they are easily removed.

When cutting soft materials, an abrasive wheel has a greater tendency to create a burr which is sometimes difficult to remove due to the ductility of the stock. This problem can be reduced and in some cases eliminated by using a softer grade of wheel, though possibly at the sacrifice of some wheel life. When cutting high carbon steel which subsequently is to be machined, occasionally work-hardening of the surface occurs. Wet cutting is often the answer.

Cutting Nonferrous Metals

While copper, brass, aluminum and other nonferrous metals can be cut with abrasive wheels, tests indicate it is often more advantageous to use a high-speed metal-cutting steel saw blade in the cut-off machine. Made of high-speed steel or of special high carbon, high chrome alloy of low filing temper, the blade is hollow ground for good clearance. As the machine is only as good as the blade, it should be properly treated and kept sharp at all times.

The saw blade, running at 2000 rpm, cuts nonferrous metals faster than an abrasive wheel and practically eliminates the burr which plagues the cutting of soft materials. Though initial cost of a high-speed blade is greater than an abrasive wheel, service life of the former is much longer.

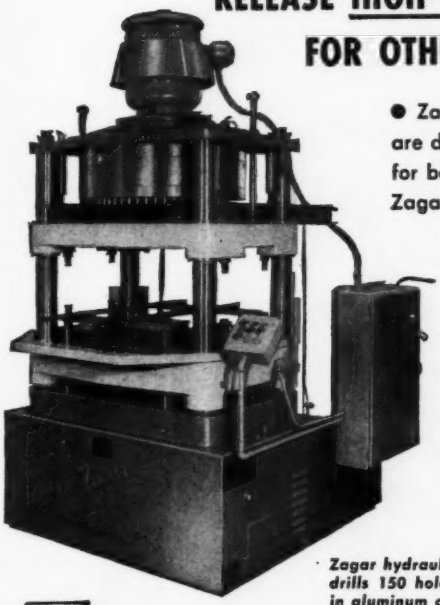
In cutting round material, both the saw blade and abrasive wheel have a natural tendency to rotate the work. This movement can cause spoilage or crowd and thus damage the blade or wheel. For these operations, a simple clamp mechanism is recommended for holding down the work. This work device is especially valuable in making angular cuts as the operator is protected from rotating or sliding work.

———•———

Top corporate executives last year failed to get salary raises proportionate to those that they gave their hourly workers, an American Management Association survey shows. Compensation paid to more than 25,000 high-ranking executives in more than 3,000 American and Canadian companies during the 1954-55 fiscal year increased by only 1.8%, on the average. This refers to total compensation, including salaries, bonuses, and company contributions to retirement funds. On the other hand, for a comparable period, hourly rates paid to workers in manufacturing industries increased by 5%, not including fringe benefits.

Zagar 4-POST RAM TYPE DRILLING MACHINES

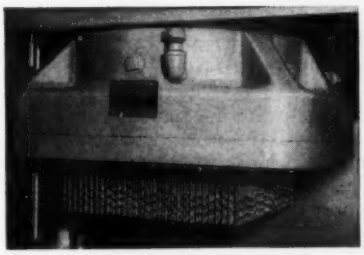
RELEASE HIGH COST DRILL PRESSES FOR OTHER IMPORTANT JOBS

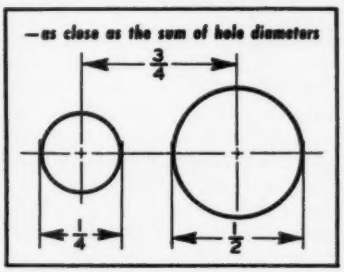


• Zagar hydraulic drilling machines are designed for high speed drilling—for both production and limited runs. Zagar 4-post machines reduce high cost tooling, and handle a range of work that ordinarily necessitates the use of *several different machines*. Very important, Zagar drilling machines release capital equipment for other purposes. Zagar 4-post machines lower your capital investment. They quickly pay out. What, sir, are your production requirements?

Zagar hydraulic ram-type 4-post machine drills 150 holes, 1/4" through 5/8" dia., in aluminum casting at one pass.

Zagar GEARLESS DRILL HEADS are the answer to close-center drilling on your own equipment





1000 spindles, drilling simultaneously, are possible with Zagar gearless drill heads. Any pattern drilling any machinable material is standard practice; any size up to 1½" dia. . . . Zagar can design the tooling for the entire drilling job; or, a Zagar gearless drill head can be used on your existing drill press. Zagar engineering is flexible enough to recommend and supply the answer that will cost the least and produce the most.

Ask for Zagar Catalog "T-1"

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

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When it comes to SOLID CARBIDE PRATT & WHITNEY offers YOU the RIGHT TOOL... for Your Job

Lasting up to 200 times longer than high speed steel and able to lower production costs tremendously, carbide *IS* the tool of today and tomorrow!

But — you *can not* simply remove the high speed tools and replace with carbide. Additional power is required to drive carbide efficiently; speed, feed and chip load must be carefully correlated with type and depth of cut, finish required and many other factors. The correct grade of carbide for *each* application must be determined.

Now — traditional Pratt & Whitney cutting tool know-how and experience, supplemented by a 10-year program of special research and development in carbides, bring you this assurance: the *RIGHT* carbide tools for your specific jobs. Send us your work blueprints and acquaint us with type of machines involved. We will be glad to submit our job recommendations.

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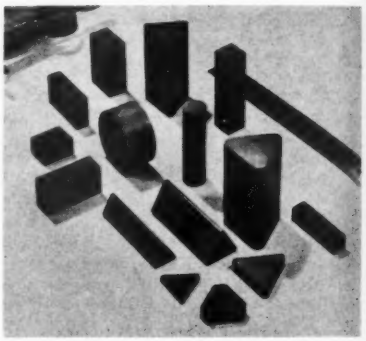
MACHINE TOOLS • GAGES • CUTTING TOOLS

IMPROVED CUTTING WITH CARBORUNDUM'S NEW CERAMIC TOOLS

Tests show that Carborundum's Stupalox, a new type of oxide-base cutting tool material, cuts at up to ten times the speed and four times the length of cut before excessive edge wear, as compared to other tool materials.

With field tests completed, commercial quantities of the ceramic cutting material are now available from Stupakoff Division of The Carborundum Co., Latrobe, Pa. Previously ceramic cutting tools have been available only in test quantities.



Stupalox, new type ceramic cutting tool material, cuts faster and wears better, opening new cutting tool possibilities.

Stupalox will cut cast steel, cast iron, chilled iron, carbon steel, high speed steel, and non-ferrous materials. Tests have been made with speeds up to 2,000 sfpm, but Carborundum reports that in many cases it has been difficult to get exact measurements of the tools' cutting ability because of limitations of test machines.

The following comparison was made under controlled conditions with all elements being equal:

Cutting Tool	Speed
Carbon steel	50 sfpm
High speed steels (tungsten, chrome, vanadium)	100-125
Tungsten carbide	250-350
Stupalox	up to 2,000

These demonstration test results indicate the performance range of the new ceramic material:

1. In machining high speed steel (207-B annealed) with hardened high speed steel tools, cutting speed was from 80 to 100 sfpm. Stupalox permitted a cutting speed of 505 sfpm with .023" feed and .125" depth of cut. Here the limitation was the cutting speed of the machine, Carborundum reports.

2. Cutting SAE 1035 steel, tungsten carbide tools allowed a speed of 250 to 350 sfpm. Stupalox, 1175 sfpm. In this test, feed was varied from .015" to .005" and the depth of cut from .005" to .250" to demonstrate the tool's versatility.

3. Nimonic 80-A previously was classed as "unmachinable." Best results obtained with titanium carbide was 80 sfpm, .005" feed, and .005" depth of cut. Tool sharpening was necessary every ¼" of linear cut. With Stupalox the speed was reduced to 40 sfpm, the feed kept at .005", but the depth of cut was increased to .100" — 20 times the depth of cut with the carbide tool.

Using Stupalox, a 3 foot length was machined in 4 min without changing the tool. The carbide tool required 40 min to machine this amount, not counting 240 resharpenings and downtime for changing tools.

The new oxide-base cutting tool material is said to cut with no build-up on the cutting edge and no cratering adjacent to it. It produces a very smooth finish, often comparable to that obtained with commercial grinding.

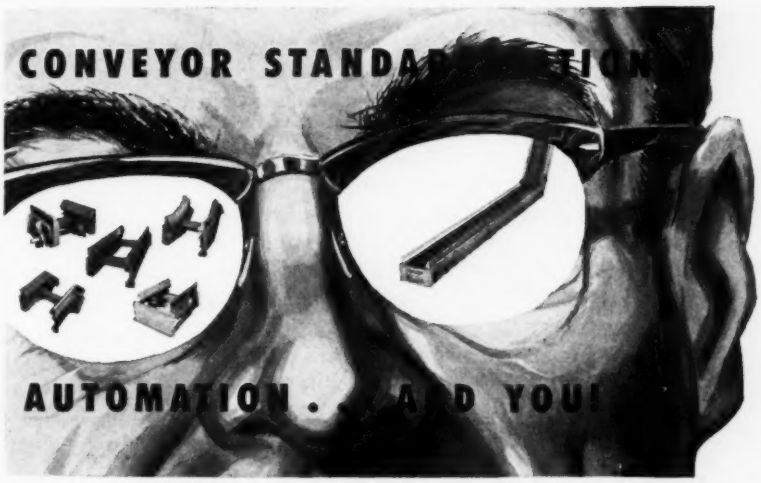
Stupalox is harder than metallic tools and more abrasion-resistant. It maintains strength at temperatures detrimental to other materials and does not generate as high heat as metallic tools.

Twisted Slide Rails Facilitate Part Orientation

A Snyder segmented transfer machine for production of automotive exhaust manifolds features a twisted slide-rail arrangement, by which manifolds can be moved and oriented without the use of pallets.

The 20-sta. machine performs all machining operations on the cast iron manifolds except the mounting faces, which are ground before the parts are loaded into the machine. Two bushings and two pins of different sizes are also hopper-fed and assembled by the same machine.

Contrary to usual practice of moving the non-symmetrical manifolds by pallets, in this machine they are loaded on slide rails that contact the ground mounting faces. Manifolds are then pushed along the rails from station to station. The parts are clamped in correct location at each machining station. Halfway through the machine, the rails twist to tilt the parts 45° into correct position for machining of certain details that would otherwise necessitate auxiliary orienting devices or a more costly mounting of machine spindle units.



Now you can buy CUSTOMIZED conveyors in pre-fabricated STANDARD sections

In a single glance, you can see all of the advantages of MAY-FRAN STANDARDIZED components.

The five standard sections shown can be assembled to form virtually any type of *"customized"* conveyor for the handling of stampings, formed metal parts, forgings, automotive scrap, chips and turnings.

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CIRCLE INFORM-A-GRAM KEY NO. 1071

. . . Machining from Page 66

self-springing split collet sleeves for gripping the work. A worn collet sleeve, or one having insufficient longitudinal draw movement will not grip the work adequately. Thus the bar may be pushed back within the collet when cutting starts, resulting in speedier blunting of the cutting edges of the tool, the development of rubbing, great heat, and work-hardening effects. These conditions will be accelerated and aggravated in cases where an excessively heavy in-feed is employed with the tool operating on work gripped inadequately in such a worn or badly mounted collet sleeve.

7. Spindle Wear and Float. Another condition very common to lathes, and drilling and boring machines, which often leads to work-hardening is that of a worn, badly adjusted, or floating live spindle. Very often this condition is hard to diagnose, and frequently passes unsuspected by the machine setter or operator when encountering work-hardening troubles.

If the spindle bearings of an automatic lathe become worn, or are slackly adjusted so that the spindle undergoes a certain degree of endwise float, a point will be reached during the cutting cycle when such slackness will be taken up by the in-feed movement of the cutter. While this slackness is being absorbed, however, cutting may be greatly reduced or even arrested altogether, thus the tool idles and tends to rub and work-hardening again ensues.

In a somewhat similar way, slackness in a tool-slide from whatever cause, may allow the tool mounted therein to stall or idle during a certain portion of the cutting cycle, so that the desired rate of feed is lost, and the tool is again induced to rub on the work during a few revolutions; sufficient, however, to lead to work-hardening.

8. Other Machine Defects. These causes of work-hardening include all those innumerable minor and sometimes major defects, often unavoidable or unpredictable, which develop with most precision machine tools, and whose effect is to stop the machine outright, reduce its speed of operation, or to cause considerable variations in the rate of travel of work, or tools, or both.

In this class may be mentioned such common malfunctions as: broken belts on pulley drives, slack and/or slipping belt drives, over-heated electric motors, and faulty clutches. Add to these failure or fracture of such common machine elements as springs, levers, cams, pins, keys, gears and such. These often tend to work slack on their shafts, or fail to hold other working elements in proper relationships.

Other frequent sources of similar troubles are poor lubrication of machine parts, badly adjusted or inadequately retained slides, toolholders, and tools; chip and dirt accumulations at vital points in the machine; wear in shaft bearings, slide guideways and the like which permits members to become misaligned, jammed, or operated with reduced precision; loose retainer screws on machine parts and so on. Indeed, included in this is any so-called minor point which tends to impede or suddenly stop the action of the cutting tool on the work, and which thereby causes the tool to rub and produce over-heating and the other kindred conditions leading directly to work-hardening.

Preventative Measures to be Adopted

In considering the effective measures which may be instituted to avoid work-hardening, it will be evident from the foregoing that the intelligent machinist or tool-setter can accomplish much in obviating this particular trouble by undertaking a careful check of the machine condition at the outset of any production run.

Such check-over should be applied when initially setting-up the machine. It should embrace the proper adjustment of all moving machine parts to eliminate slackness or stiffened operation. Driving belts, chains, gearing, etc., should be tested for soundness, proper fastenings, absence of slip and freedom from vibration during running. Machine slides and shafts, etc., should be scrupulously cleaned and correctly lubricated.

Extra care is required to insure that cutting tools are sharpened in the correct manner, having cutting edges honed or lapped to produce the keenest cutting edge or point, and the smoothest possible finish on clearance surfaces.

In this regard the writer found it a most efficient and economical practice to provide the tool-setters with a set of properly designed, perfectly flat, hand-lapped stones in the appropriate grits and grades. Thus, the cutting edges of tools can speedily be restored to the desired sharpness by the setters. This was a marked improvement over the conditions prevailing when each setter was allowed to find his own stone and was often satisfied to use any worn or odd quality of stone at hand. The lapping stones should be regularly returned to the toolroom for checking and correction to restore original flatness and clean cutting condition.

Accurate means should also be supplied to the tool-setters for reproducing quickly and to close limits the correct rake and clearance angles on cutters. This is best provided by simple grinding fixtures in which a tool may be easily mounted and clamped, and thereby

. . . Continued on page 110

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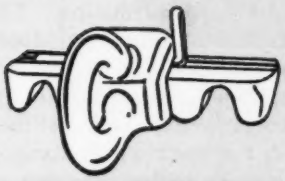
SUPERIOR DIE SETS

Large Sets No Longer Need Be Blocked . . . Small Sets Can Be Lifted Without Sliding.

Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. Write for FREE 24 page Catalog on Superior Die Sets and Supplies.

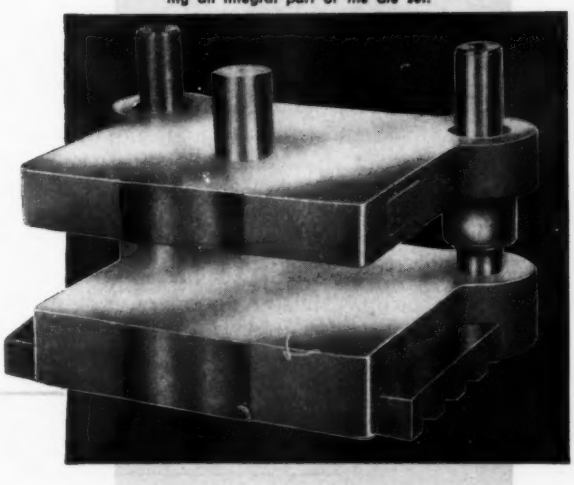
SAFETY FLANGE

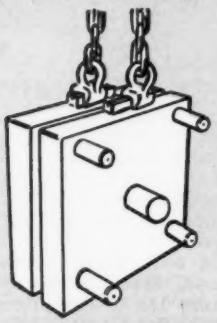
protects fingers by providing roomy gripping space on either side of the die shoe.



LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set.





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is especially designed to fit the flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs.

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SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1091

. . . Machining from Page 108

correctly oriented for the respective top rake, side and front clearance angles. A strict rule should be enforced that no cutter intended for alloy or stainless steel may be finish ground by off-hand methods, but that the fixtures must be employed in all cases.

Use of these fixtures when making or regrinding tools ensures standard forms and angles; and will also greatly reduce tool-rubbing on the job, thus obviating numerous instances of work-hardening. They will also lengthen the working life of tools and greatly simplify setting.

Apart from the causes of tool-rubbing mentioned earlier, rubbing sometimes occurs as a result of: toolposts which stand out of square with the slide; toolposts which are insecurely clamped to slides due to faulty or weak bolts; clamping the tool in a toolpost-slot which is burred, worn, or otherwise damaged so as to allow the tool to tilt when being fastened. Attention to these points will amply repay the setter in the avoidance of rubbing, overheating and work-hardening.

Machinists and setters should similarly observe the strict rule never to change the rate of cutter feed or the speed of the workpiece while taking a cut. This rule should be rigorously applied during all normal production runs as well as when the machine is being initially set up. Thus numerous sources of intermittent or interrupted feed of tools, or stalling of tools on the work will be eliminated and the risks of work-hardening similarly lessened. Occurrences of this character will then be limited to those unforeseeable and usually unavoidable stoppages due to some breakdown of the machine or the drive thereto.

In order to avoid excessive heating of tool and workpiece the setter must check the quality and volume and direction of flow of the coolant. The feed rate and surface speed must be appropriate to the size of work, best cutting technique and amount of stock to be removed.

Other checks and adjustments which should also be conducted at this preliminary stage are:

(a) Adjustment of the live spindle of the machine to remove all sideplay and endwise float.
(b) Testing of the security of tool retention on machine slides.
(c) Checking of the capability of collet sleeves and other gripping devices to hold the work firmly against the heaviest cut, always making sure there is an ample reserve of gripping pressure to compensate for the additional cutting load as tools become slightly dull.

All of this represents a fairly comprehensive yet general procedure, directed to the attention of the maintenance engineer, tool-setter and machinist, which can easily be developed into a systematic scheme of standard practice where considerable quantities of stainless or alloy steel parts are being machined.

Editor's Note: The second part of Mr. Halliday's article will appear next month in our 7th Annual CARBIDES Feature Issue. Appropriately, it will deal with cutting tool geometry modifications which can be employed to overcome the effects of work-hardening in stainless steel.

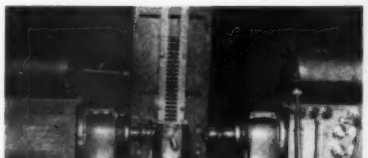
Automated Facing Machine Built from Stock Drill Heads

The discovery that automation can be done on a small, inexpensive scale with standard stock equipment has led to a production increase of over 300% for a Chicago metal fabricating firm. A pair of automatic drill units were the only major equipment purchased, yet production has jumped from 135 to 500 pieces per hour for Star Tubular Products Company on facing and de-burring welded steel pipe sections. The automatic drill units were standard Dumore models with all pneumatic and electric controls built in, which simplified installation and reduced control problems.

Formerly, the facing and de-burring job required handling each part three times—once to do one end, then a separate handling operation to remove the part and reverse it in the work fixture, and finally the facing and de-burring of the opposite end. Now, the pipe sections are stacked in a hopper which delivers them to a fixture. As the part falls into the fixture, a clamping device is actuated. This also triggers the two Dumore drill units which advance both drill heads simultaneously, face and de-burr both ends of the part and then retract—all automatically. Work feed is controlled through the automatic circuits in the drill units.

Not only has this automatic set-up boosted production, but the increased accuracy of the finishing process has permitted the company to roll-cut the pipe sections instead of square cutting for a 300% reduction in cut-off time!

Because of the mounting flexibility of the Dumore drill units, the machines can be transferred to other drilling, tapping or reaming operations in the shop if desired.



This "special" machine was built by using two inexpensive Dumore automatic drill units and a simple feed hopper. It faces and de-burrs over three times as many steel pipe sections as turned out by a previous method.

DIAMOND MACHINE TOOL COMPANY
PICO, CALIFORNIA

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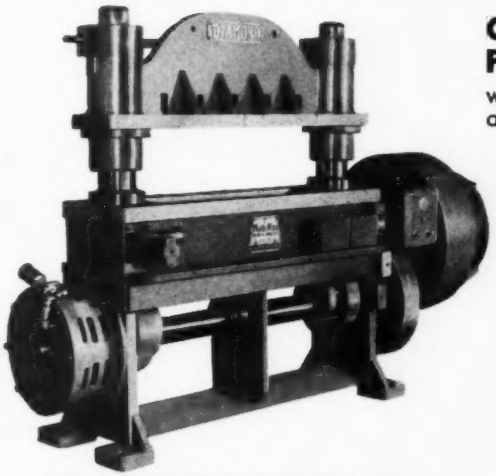
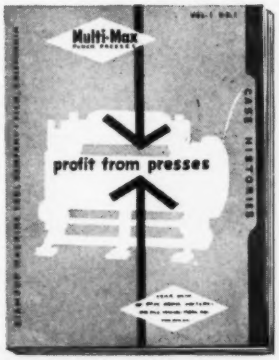


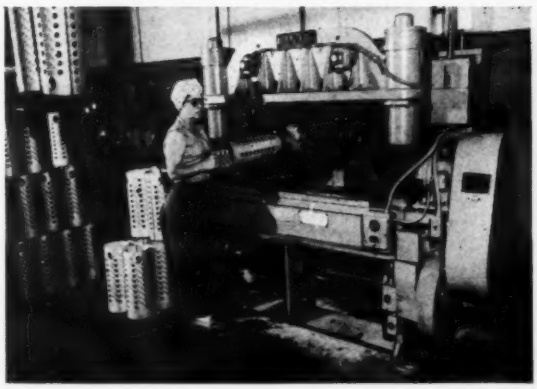
DIAMOND MULTI-MAX PUNCH PRESS
MODEL 5036 ILLUSTRATED

OPEN THROAT PRESSES...

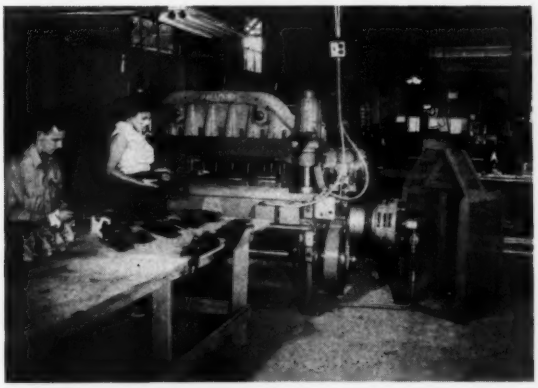
with long bed and ram areas illustrated in a new catalog, "Profit From Presses". Twenty pages with case history photographs such as illustrated below. Diamond Multi-Max punch presses are available in 30 and 50 tons capacity, 100 tons on special order. Six models for your selection. 24", 36", 48", 60", 72" and 84" working surfaces of bed and ram lengths. Air clutch and air brake at no extra cost. Mail in above coupon for your copy of this catalog, or writeon your letterhead.



SALES AND SERVICE IN ALL PRINCIPAL CITIES



SOLAR AIRCRAFT COMPANY, SAN DIEGO, one of three Multi-Max presses used by Solar Aircraft Company in perforating parts of combustion chambers for jet engines. Large bed area required for two stage dies. Large shut die height required for insertion and removal of bulky combustion chambers.



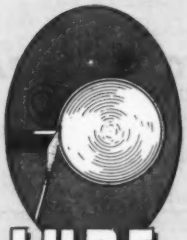
SAURENMAN COMPANY, INC., EL MONTE, assembling and riveting Saxton Kant-Twist clamps on a Multi-Max press. Large press bed area is required for the permanent installation of nine dies for riveting nine different size clamps from one inch opening to twelve inch opening. Advantage of this permanent multiple die set up is in riveting various size clamps.

DIAMOND MACHINE TOOL CO.
PICO, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1111

Faster Cutting Longer Tool Life

with Norgren SPRAY-LUBE



Faster Cooling

Norgren SPRAY-LUBE applies a spray of coolant upon the close interfaces of the cutting area. Because of the larger fluid surface area of the spray and the expansion of the compressed air, heat is dissipated quicker. Cutting can be faster—production stepped up.

Better Lubrication

Norgren SPRAY-LUBE provides a more thorough lubrication at the cutting point between the tool and work piece. Tool wear is less—saves tool costs, cuts down-time.

No Waste of Coolant

Norgren SPRAY-LUBE sprays coolant exactly where needed. Normally, only 4 to 12 fluid ounces per nozzle per hour provide the right amount of lubricant to cool and lubricate the tool and work piece. There is no excess of coolant to flood machine, operator or floor.

30% More Output From Tapping Machine At The Square D Company By Using Norgren Spray-Lube

At the Square D Company, Milwaukee, the machine pictured above was originally equipped with a flood system to lubricate and cool the taps. Parts produced were so drenched with lubricant that they had to be drained and wiped before the next production step.

Over two years ago, a Norgren SPRAY-LUBE system was installed. On the job shown—tapping three holes in each of two switch box covers—SPRAY-LUBE has eliminated excess of lubricant and the time lost for cleaning parts. As a result, working conditions have been greatly improved and production has increased 30%.

For complete information about this application, call your nearby Norgren Representative listed in your telephone directory—or write for Blueprint SL-5.

C.A. Norgren CO.

3449 So. Elati, Englewood, Colo.

AIR LINE FILTERS • PRESSURE REGULATORS • LUBRICATORS • AIR CONTROL VALVES

CIRCLE INFORM-A-GRAM KEY NO. 1121

Printed Circuits Manufactured by Cleveland Firm

Complete facilities ranging from design through the manufacture of printed circuits have been announced by Cleveland Metal Specialties Co., 1783 E. 21 St., Cleveland.

"We have been working with printed circuits for some time," Roger Middlekauff, company president said recently, "and realizing its vast application to the entire electrical field, have geared our organization so that we can produce printed circuits from its basic design through the final stages of the finished product."

The company is producing the circuits in multiples and is using the photo etching of copper laminate process with the circuits shipped ready for dip-soldering and assembly.

It has produced printed circuits for electronic instruments, appliances, ordnance and automotive uses.

An additional feature of the company's service is an exclusive tin plating process. It increases the eutectic qualities of the copper conductors and provides long term corrosion resistance in addition to providing easier soldering.

Films to See

"Progress in Precision" is a new film which will be of interest to persons concerned with stock removal processes and precision and functional surface finishes. The 30-min., 16mm movie may be obtained by writing to Micromatic Hone Corp., Advt. Dept., 8100 Schoolcraft Ave., Detroit 38.

Applications of the latest developments in bonded sandwich structures to Martin's new XP6M-1 multi-jet seaplane are featured in "Marbond". This 16 mm color-sound film is available on a free-loan basis from The Glenn L. Martin Co., Presentations Section, Mail 376, Baltimore 3, Md.

The U. S. Multi-Slide stamping machine, its construction features and operation, are covered in a 16-mm, black-and-white sound movie. This film which runs 22 min., is made available by U. S. Tool Co., Inc., Ampere (E. Orange), N. J.

Five new color and sound movies are described in a leaflet issued by E. W. Bliss Co., Canton, O. They included "Power Press Maintenance", "Bliss 1000th Transfer Feed Press", "Transfer Feed Presses in the Appliance Industry", "Bliss High-Speed 1831 Strip Feed Press", and "The Bliss-Crary Tonnage Limitor".

Your Own
COMPARISON TEST
PROVES

NU-CUP SET SCREWS have greater holding power

Without cost or obligation, send for the "Nutcracker" Testing Tongs to compare Nu-Cups, yourself, with the set screws you are now using. See with your own eyes conclusive proof of Nu-Cup's greater holding power. See how Nu-Cups end slippage, screw heads cracking, and other set screw troubles. In addition, get all these other advantages:

now available with Hexagon Socket Head

.... in addition to slotted and slabbed head types. Also, Nu-Cup often makes possible use of smaller screw, so you can standardize on one size and get the savings of larger quantity orders.

THIS IS THE SIMPLE COMPARISON TEST:

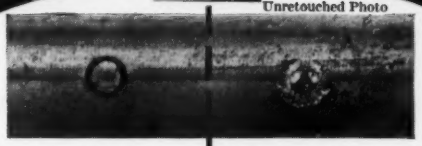
① Insert screw you now use in one collar of Tester and Nu-Cup Screw in the other. Tighten screws to set against shaft at same torque. Mark indicating discs to line up with mark on each collar.

② Grip handles and gradually apply pressure. Collar mark that moves first indicates screw that has less holding power. See for yourself how Nu-Cup outholds all competing screws.

③ Remove shaft and compare impressions left on shaft by points of the two set screws (see illustration at right).

the shaft tells the story!

Unretouched Photo



Deep, Full Circle Impression of Nu-Cup ... shows complete penetration, providing greatest removal resistance and holding power.

Half-Circle Skid-Mark Impression of Conventional Screws ... shows lack of penetration, permitting slippage.

... And This Is The Reason
42% Sharper Angle on Nu-Cup

This sharper angle PLUS specially heat-treated alloy steel permits higher setting torques with less danger of screw failure.

Wide Angle Point on Conventional Set Screws is unable to withstand the higher setting torques required by many applications.

SET SCREW & MFG. CO., 158 Main St., Bartlett, Illinois
I would like to make my own Set Screw comparisons. Without cost or obligation, please send me on loan, the items checked.

☐ "Nutcracker" Nu-Cup Tester ☐ "Jewel Case" of 30 Set Screw Ideas

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We specialize in Solving Puzzling Set Screw Problems

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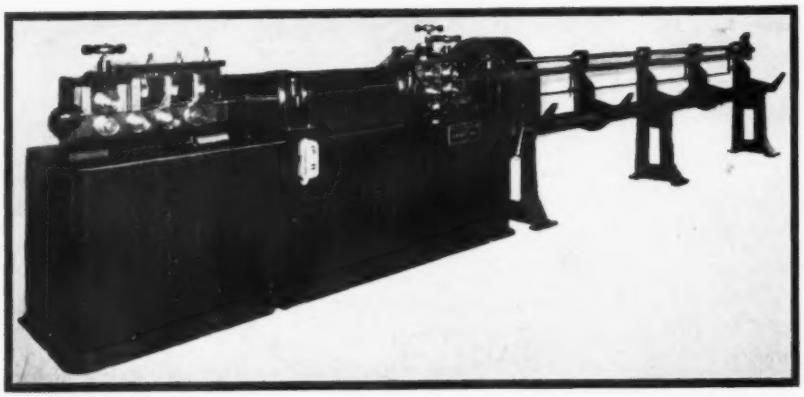
CIRCLE INFORM-A-GRAM KEY NO. 1131

CONTROL IS THE GOOD WORD from SHUSTER



Dual Control 4AV — Straightens and Cuts 3/8" to 11/16" diameter basic wire. Geared to feed 90 to 180 feet per minute.

Individual Control of Speed and Cut Off

With the Dual Control 4 AV you can run at the most efficient speed for the characteristics of the wire being used. And you get a clean cut at any length. Send for details.

A COMPLETE LINE

Constant Speed Machines are available for straightening and cutting wire from .025" to 1/2"

Constant or Variable Speed Units with electrically controlled clutch and target are available from 1/16" to 1/2"

Other variable speed machines may be furnished to straighten and cut wire up to 11/16"

ALSO

Slide Feed Straighteners 3/8" x 10"; 9/16" x 10"
Feed Starters maximum 5/8" diameter

Tube and Bar Straighteners 7/32" to 5/8" bar; 1" tubing

Reels for coils up to 300 pounds

Send for free, wall-size, split-gauge wire chart, from 41 gauge to 7/0.

SHUSTER
Since 1866

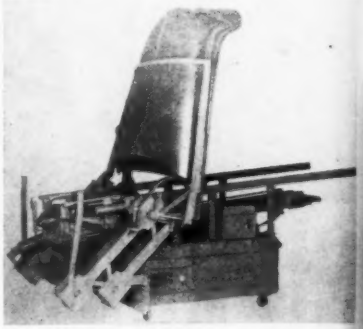
METTLER MACHINE TOOL, Inc.
150 West Adeline St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1141

Automatic Machine Feeds Stampings into Trim Die

A new machine, designed to feed heavy metal stampings into a trimming die, will take a stamped panel, turn it over, and then automatically feed it into the trimming die.

This new machine combines the features of the Hamilton shuttle hand and the Hamilton leaf turnover units and has been developed to augment the line of automatic pressroom parts handling equipment manufactured by Hamilton Automation, Inc., 1490 Edison Ave., Hamilton, Ohio.



Completely portable, and having a feed stroke of 84", this unit is mounted on steel casters so that it may be easily moved from press to press. It operates on 110-volt current, thus no special electrical installation is necessary. All controls are mounted on one side of the machine.

The new unit is basically the standard Hamilton automatic shuttle hand equipped with special index bars and an integral attachment for turning over metal stampings after they are received by the unit. It is designed for service in any pressroom handling heavy metal stampings. The turnover unit can be constructed to fit special shapes in stamped panels.

To round out a complete line of automation equipment, Hamilton has developed and builds an automatic shuttle hand which feeds, pulls, or indexes parts in or out of presses; a press hand, which automatically pulls parts; a sheet lifter, which automatically lifts and transfers sheets from reserve pile to sheet feeder; a leaf turnover, which automatically turns parts over for the next operation; an automatic turn, which turns parts up to 180°; and a Robot control, which synchronizes tripping of all the units in the complete line.

BUY U. S. SAVINGS BONDS

NEW
design freedom

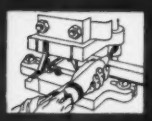
FEATURED IN THE EXPANDED DANLY DIE SET LINE

NOW Danly meets or beats all ASA standards . . .

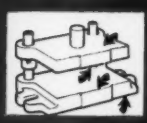
with the world's broadest die set line. There's no need for compromise between the standard set you want and the set you can get. less need for costly specials. The new line of Danly Standard Die Sets has die space and guide post dimensions that equal, or exceed, ASA specifications. Under the new standards, front to back die space is measured *from edge of bushing to front of die set*

In addition to offering a complete selection of ASA standard die sets, Danly provides the Danly Standards proved popular over the years . . . all available from stock at your nearest Danly Branch. You can be sure of meeting all your die set needs at Danly . . . either ASA standard or Danly Standard.

NOW Danly offers you these additional features



Oil Lubrication System For Shoulder Bushing Sets. This new Danly die set feature ensures longer life, easier maintenance, proper lubrication even during long runs.



All Horizontal Surfaces Ground On Shoulder Die Sets. Horizontal surfaces, including top of punch holder and bottom of die holder, are ground to the same finishing precision as the inner die set surfaces.

Integral Welded Shanks. Used on all steel sets regularly furnished with shanks, gives greater strength and rigidity. Deep counterbores in punch holder have less tendency to weaken set.

DANLY®

DIE SETS AND DIEMAKERS' SUPPLIES

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

. . . Measuring Millionths from Page 68

Grade A blocks are received by the user from the manufacturer guaranteed to within ±4 millionths. It is therefore possible for an inspector, in using a pile of five blocks to obtain a certain size, to have an accumulated error of 20 millionths of an inch . . . plus or minus . . . and not know it.

Grade AA master gage blocks are guaranteed to ±2 millionths. To achieve these accuracies with steel was always a costly business. It was customary for the gage block manufacturer to make a set as accurately as possible, but always leaning toward the high limit, and then to send the set to the Bureau. Any blocks found by the Bureau to be out-of-tolerance would be sent back to the gage manufacturer with a supposedly-precise calibration on each block. The gage manufacturer would proceed to take off the necessary amount and then to send the blocks to the Bureau for a second reading. Even if the gage block manufacturer had taken off precisely the right amount, the Bureau's reading might not show it exactly . . . due to the several variables always entering into the measurement of steel blocks. Eventually, the gage block set would be complete and then would be returned to the gage manufacturer with the Bureau's O.K.

The Bureau's calibrations, of course, constitute the legal measurements. Inspection and working sets of blocks are manufactured to the Bureau's specifications. In some cases, it has been found that the user is working to such ultrafine tolerances that he needs a more precise calibration. In this case, Webber can furnish a chrome carbide Laboratory Master set together with his calibration of each block to two tenths of a millionth. The reliability of these readings is assured by Webber's use of the famous Zeiss Opton interferometer, with which measurements are taken by means of reflected light-wave interference pattern. This is similar to but a later model of the instrument used by the National Bureau of Standards.

The Webber Gage Company's Metrology Laboratory, where all master gage blocks are checked and calibrated, is in charge of a trained physicist. She has studied the practices of the National Bureau of Standards, while George Webber, Jr. has also studied at the Carl Zeiss works in Germany. In addition representatives of both Carl Zeiss and the Bureau have consulted with Webber personnel at Cleveland.

The Metrology Laboratory is equipped also with an interference microscope and Brush surface analyzer equipment for surface investigation and with a Cleveland electronic microcomparator for preliminary dimensional readings. Humidity and temperature are kept under close control, around the clock, and 365 days a year. Electronic filters ensure dust-free air.

"There are people who fight against any change and anything new, but thankfully they are in a minority", George Webber, Sr. claims. "In general, it is difficult to get people to go back to high speed steel once they have used carbide for cutting tools. The same is true when they've used chrome carbide gage blocks.

"It is our aim," asserts Webber, "to furnish all manufacturers of precision machined parts with our chrome carbide Laboratory Masters and with chrome carbide working sets for shop use; and, in that way, we will have achieved the ultimate in interchangeability throughout this country."

Chrome carbide gage blocks have already been of inestimable value to numerous companies working to extreme accuracies such as manufacturers of ball and roller bearings, components for guided missiles, and precision instruments. One user is being asked to guarantee spindle bearings to machine tool builders to be accurate within 20 millionths and better. Other manufacturers of gaging and inspection equipment have found chrome carbide of great value in raising the standards on their own gages and equipment. Manufacturers of airborne instruments, being required to work to six-place tolerances themselves, are finding chrome carbide gage blocks to be a "must".

NOMINATE NOW FOR REDESIGN AWARD

Entries for the 1956 John Woodman Higgins Redesign award are being accepted now by the Pressed Metal Institute, according to Harold A. Daschner, Managing Director.

The annual award which offers a cash prize of $500 was established last year by the Worcester Pressed Steel Co. as an industry service to encourage recognition of original and outstanding redesign work in the field of metal stampings.

Award choice will be based on successful production by metal stamping of a part previously turned out by another metalworking process, originality of design, and significant cost savings realized in the change-over to the metal stamping process.

Entries are to be submitted before Feb. 15 to the John Woodman Higgins Redesign Award, Pressed Metal Institute, 3673 Lee Rd., Cleveland 20, Ohio. Presentation will be made at the Spring Technical meeting of the PMI in Cleveland, Mar. 14-16.

The 1955 award was presented to two General Electric design engineers, J. B. Horvay and D. A. Solley, for their original redesign of a drain trough of an automatic two-zone refrigerator.

which shall it be...

FREEDOM or TOTALITARIANISM?

"As the twig is bent the tree's inclined"... That's why totalitarianism is so anxious to clamp its system on the minds of youth. And that's why it's so important that groups of our boys and girls are receiving experience and training in American free enterprise —through Junior Achievement.

They learn, by actually running their own business, how profits are made and companies prosper under our economic system. They form their own companies, float stock, go into production, keep their own books, merchandise, advertise—and pay dividends to their stockholders. Long before they leave school they're well acquainted with the ways of the business world.

Junior Achievement is sponsored by leading corporations and staffed by volunteer advisers from all phases of those businesses. It's a proving ground for American industry—an idea that's spreading to other countries—an opportunity for young people to acquire understanding and respect for the competitive way of doing business.

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

Published by **Huebner Publications, Inc., 1975 Lee Road, Cleveland 18, Ohio, Fairmount 1-4040**

. . . Automate from Page 72

economies of a proposed automation setup have been determined, it can be decided what design changes should be made and just what equipment should be built.

Build or Buy?

At this point it is necessary to compare the advantages of building the equipment yourself and doing the engineering work yourself as opposed to having it done by an outside firm. The usual "build or buy" procedures are applicable here; however, it should be kept in mind that because of the relatively complex nature of automation equipment your existing facilities may not be able to handle them.

Electrical, hydraulic and electronic controls are usually essential elements of automation equipment and unless your existing personnel are qualified and thoroughly experienced in these fields you would probably do better to have an outside firm do your building. Furthermore, multiple operations done sequentially at high speed in a single machine or closely coordinated machines demand wear-resistant materials, finest craftsmanship, and often "gagemaker's quality" in the mechanical workings of the equipment. Even allowing a reasonable profit, the cost of building such equipment outside may still be considerably less than your build cost because of the experience of the outside firm.

After the equipment is built, comes the often trying and therefore appropriately named tryout period. Here is where any inadequacies of an engineering organization come to light. Of course, if an outside source is used to build the equipment, this problem is out of your hands. Once the equipment is in operation the problem of training operators arises.

As a practical matter the operator problem is not as difficult a one to solve as the problem of training maintenance and setup men. Very often the operator, if there is one, need only load the automatic feeding equipment and push the start button. However, a maintenance man must be able to troubleshoot not only the complex mechanical equipment but the intricate controls as well.

In some instances it may be desirable for one person to perform the duties of setup man, operator, and maintenance man. This might be the case where the multiplicity of operations and the size of a single piece of equipment would justify the full attention of a technician specially trained for this work.

The term "consultant" has been used loosely in this article. As pointed out earlier the consultant services can be best provided by a group rather than by one individual. This group may be commonly identified as an engineering firm or as a machine tool or equipment builder.

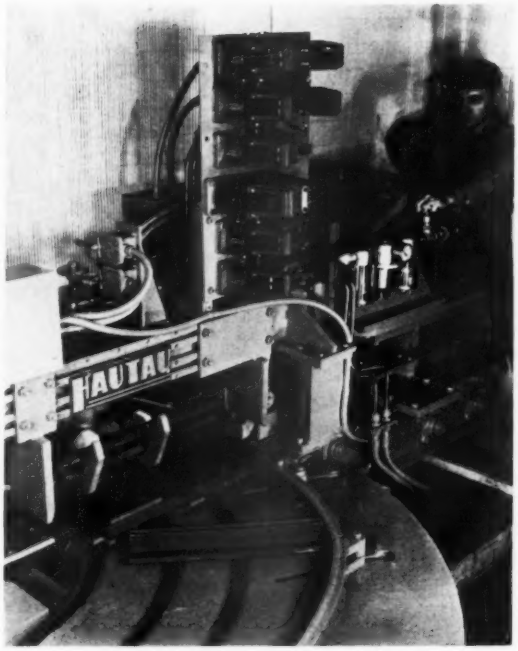
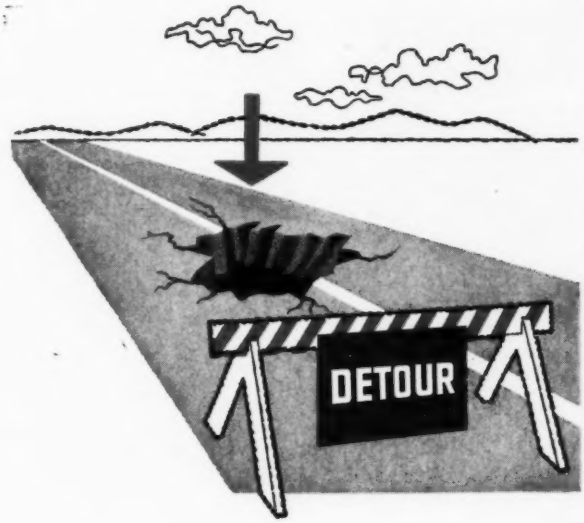


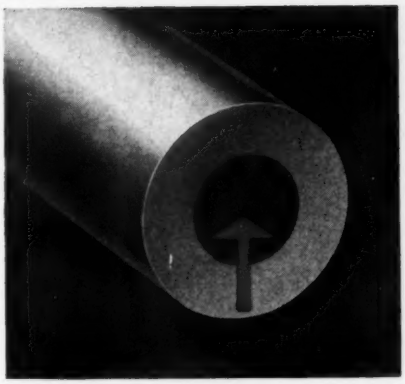
Fig. 4. The complex nature of automation equipment and the hydraulic and electronic controls involved requires that specialists design and build it.

It must be remembered, however, that many good designing firms can neither formulate the original automation appraisal nor assume completely responsibility for an automation project. On the other hand, many firms concentrate on, and have extensive experience in, the design and/or construction of automation related to a particular industry, or to a particular process, machine, or type of operation. Such experience is often called upon, especially when the problem is similar to many others previously encountered and a conventional solution is believed to be in order. An entirely new approach, however, is most likely to be made by a group that has not confined its efforts to one industry, process, or machine.

In summation it becomes apparent that unless your organization is willing and able to create an independent group that will specialize in automation appraisal, design, and building it would be better to hire outside talent that is experienced in the field. The way to test the merits of an outside group is to check with their previous customers. Always ask for references; a worthwhile group will be able to furnish them.



a hole here wastes time . . .



a hole here saves time

Crucible Hollow Tool Steel Bars save time — and money too — whenever you need ring-shaped steel parts, or tools with a center hole. The tool steel is drilled through when you get it! You don't need to bore, drill, hole-saw, cut off or rough-face. That's why they cut your production time, increase machine capacity — and reduce scrap losses.

You can get these hollow bars in any of Crucible's famous quality tool steels, in almost any combination of OD and ID sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening; SANDERSON water-hardening; AIRDI 150 high carbon, high chromium; AIRKOOL air-hardening; and NU DIE V hot-work tool steels — from the Crucible warehouse near you.

Call your Crucible representative for the full story of how these steels can save time and money in your shop. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

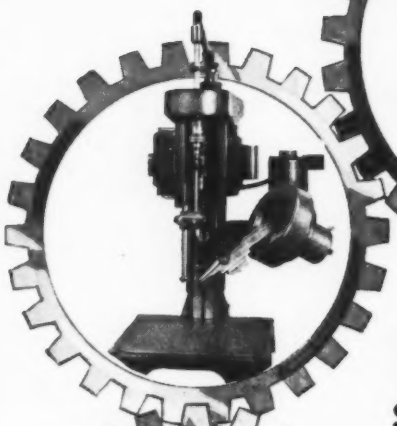
CRUCIBLE first name in special purpose steels

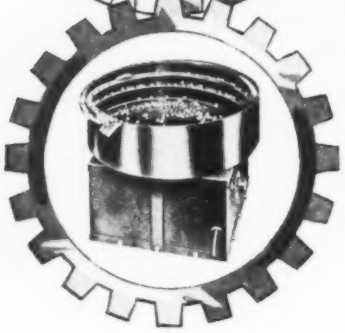
Crucible Steel Company of America

CIRCLE INFORM-A-GRAM KEY NO. 1191

Are You Geared to Meet Today's PRODUCTION DEMANDS?

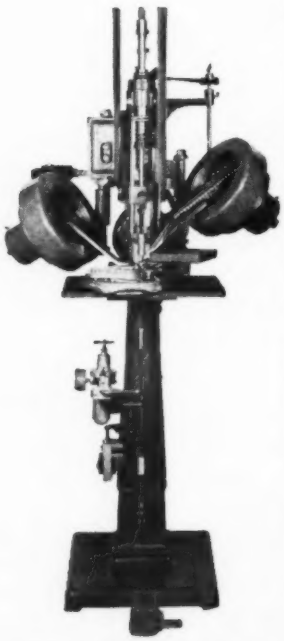
MAXIMUM OUTPUT — MINIMUM COSTS





DPS POWER SCREWDRIVERS and SELECTIVE FEEDERS *enable you to meet requirements in today's competitive market.*

● Line up this modern "gear train" for added profits. The DPS Power Equipment line is complete and flexible . . . Adaptable to the majority of production bottlenecks . . . It could be the answer to your problem . . . Tell us your story . . . Send for detailed catalog . . . Write today.



DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICHIGAN

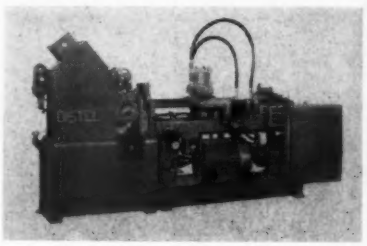
CIRCLE INFORM-A-GRAM KEY NO. 1201

Forming Automatic Transmission Brake Bands

Automatic transmission brake bands are roll formed, cut off from strip stock and brake lining bonded to the bands in a combination of two recently developed special machines.

The first machine (illustrated), built by Distel Tool and Machine Company, Detroit 7, is designed so that the bands are roll formed and cut off from coil stock without flattening the ends.

The machine operates without lost motion, thereby forming bands without any scrap stock. The radius of the bands is held constant at both ends, thus neither convex nor concave surfaces have to be contended with.



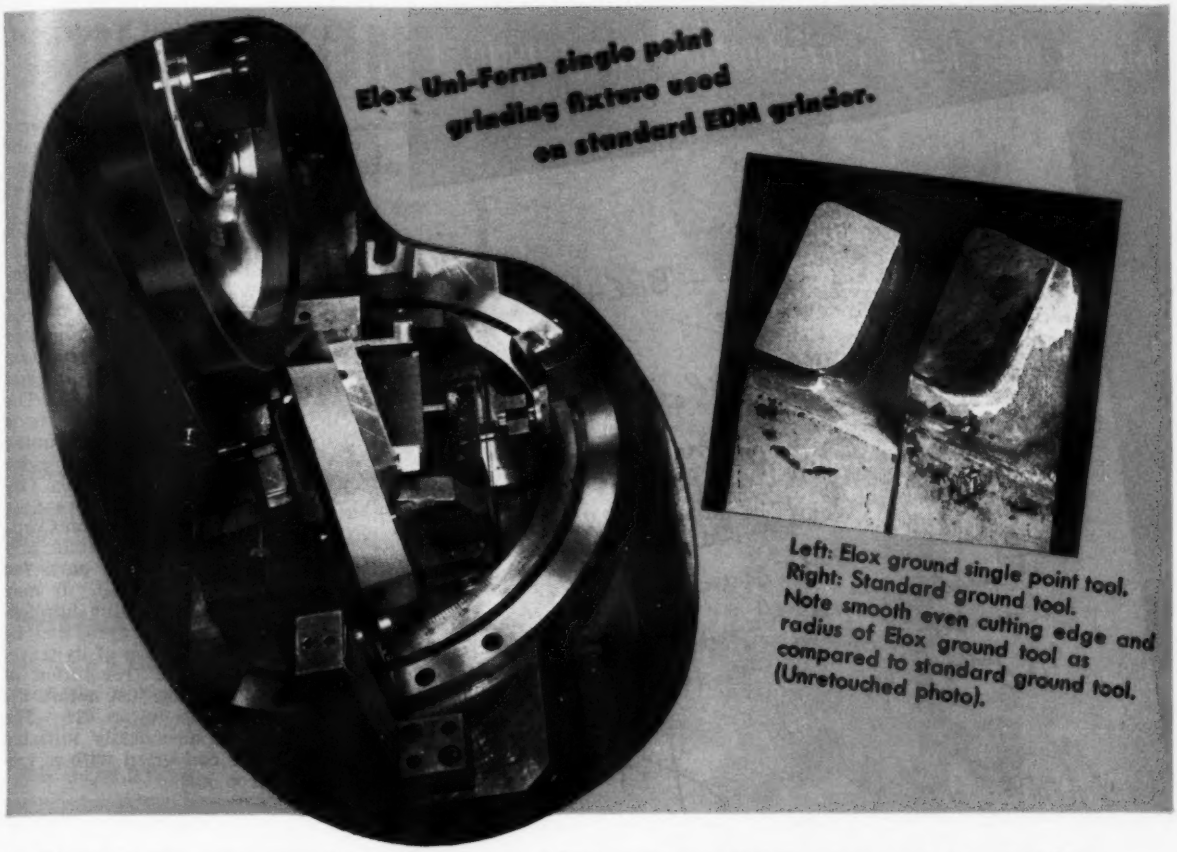
The machine is designed to produce bands with diameters ranging from 6" to 10" and with a few simple adjustments, changes in model specifications can be easily made.

The other unit bonds brake lining to the steel bands, by low voltage electric heating elements, at the rate of 360 bondings/hr. It is a rotary indexing machine with 42 stations, each station acting as a complete unit with its own air cylinder, signal lights, and gage. If one or two stations fail to function, the machine will continue to operate.

The machine is equipped with one shot lubrication for the entire machine. It is also equipped for semi-automatic loading and automatic unloading.

———— • ————

Wales-Strippit Corporation's newly introduced "Pay-As-You-Produce" plan facilitates purchase of metalworking machinery by offering hole punching and notching equipment on long term installment arrangements. It features graduated payments and terms running from three to 10 years.


Elox Uni-Form single point
grinding fixture used
on standard EDM grinder.
Left: Elox ground single point tool.
Right: Standard ground tool.
Note smooth even cutting edge and
radius of Elox ground tool as
compared to standard ground tool.
(Unretouched photo).

grind 2 faces and radius on 1/2" x 1" carbide insert in 3-1/2 minutes automatically . . . repetitively . . . without variation . . . without heat checks . . . without manual assistance!

elox* corporation of michigan

1834 Stevenson Hwy.
Royal Oak 3, Mich.

DEMONSTRATION CENTERS:
Plant—Royal Oak, Mich.
45 Broad Ave., Palisades Park, N. J.
1907 W. Monterey, Chicago, Ill.

Elox Electrical Discharge Machining of single point tools is an electronically controlled push button operation. Variable human elements are completely eliminated, guaranteeing every tool sharpened identical as to finish, radius. Grinding is done with a brass wheel to any pre-determined specifications. Every tool repetitively uniform!

Advantages of Elox Uni-Form Tool Grinding:

- **Permits use of standard blanks**
- **Every tool is identical as to radius, finish**
- **Increased tool life**
- **More regrinds per tool**
- **Eliminates diamond wheels**
- **Carbide and tool shank are ground simultaneously**
- **Averages 40% labor savings**

See Elox Uni-Form Single Point Tool Fixture in operation at Elox Demonstration Centers.

Elox Electron Drill equipment for removing broken taps, drills, etc. from $495 to $3450.

*T. M. Reg.

CIRCLE INFORM-A-GRAM KEY NO. 1211

Memo that kept a production line running!

MEMO:

TO: Production — Bill H.

FROM: Purchasing

Bill — Regarding that carbide drilling + reaming problem you called about — I've checked carefully and am calling in a Chicago-Latrobe service-engineer. I understand they are top trouble shooters on this kind of job.

Good — you've called the right man

J. R.

Bill H.

Chicago-Latrobe makes carbide drills and reamers of a quality that is unsurpassed—in a complete line—and backs these tools with the kind of service that keeps the production line running. Try them and see.

Chicago-Latrobe

CARBIDE DRILLS and REAMERS

Stocked and sold by *service-minded* Industrial Distributors

DOUBLE CIRCLE TOOLS

CHICAGO-LATROBE

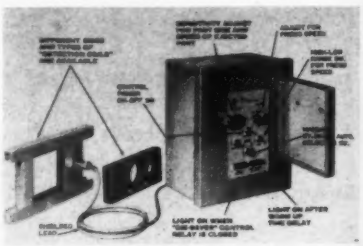
411 W. ONTARIO STREET • CHICAGO 10, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1221

NEW PRESS CONTROL STOPS PRESS AND DIE DAMAGE

The "Die-Saver", a new electronic control, is designed for easy attachment to stamping presses and to reduce or eliminate the possibility of damage to dies and presses due to "double heading" on non-ejected parts. It also reduces the possibility of accidents, allows faster automatic feeds, increases production, permits one operator to control more than one press, reduces operator fatigue, provides more inspection and stock handling time, and counts only the parts stamped. The fail-safe control is enclosed in a 6½" x 10½" x 12" shock-mounted cabinet which is easily portable for quick press mounting near any 115-volt, 60-cycle outlet.

This unit built by Robotron Corp., 21417 W. 8 Mile Rd., Detroit 19, prevents recycling if ejected parts fail to pass the detection coil. It may be used for any stamping application where the press cycle can be made to stop at the top of its travel as it completes 360° revolution or can be made to stop just before the punch enters the lower die. The press must be electrically initiated or it may be converted with a special Robotron kit.

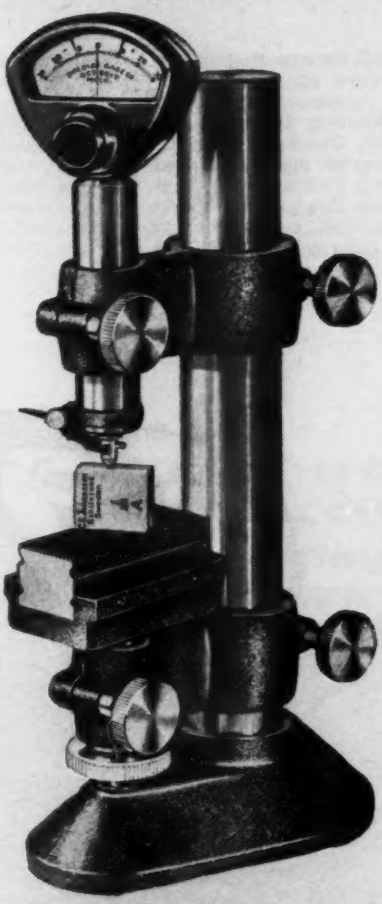


Other features of the "Die-Saver" are: any type of counting device used with it will count only parts processed, not machine cycles; a socket is provided for connection of a pre-set counter to shut off press at a certain number of parts; detection devices are available in various sizes and types to suit application; the control relay and time-delay for tube warm up are plug-in type for quick replacement.

The operating principle is based on stamped ferrous or non-ferrous metal parts passing the detection device at intervals set on the "Die-Saver" control panel. This causes an electrical impulse which energizes a control relay and closes a set of normally open contacts for a predetermined period. The contacts will stay closed as long as these impulses are repeated within the interval set on the dial, indicating normal part ejection. When impulses repeat outside of this interval, the parts are not being ejected fast enough and the relay contacts will open, stopping the press. Thus manual control is eliminated.

JOHANSSON GAGING EQUIPMENT

Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement.



GAGE BLOCKS

(JOHANSSON) and accessories.
Short deliveries. Inspection and reconditioning service available at our plant.

INTERNAL INDICATORS

(for inside measurements .155 to 24 inches) Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000002 or .001 M to .0002 M.

OTHER JOHANSSON PRODUCTS

Micrometers, Snap Gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators, Interferometers, Plugs, Rings and Special Gages.

Write for Literature

MIKROKATORS (AMPLIFIERS)

FOR MEASUREMENTS IN INCHES

Catalog Number	Scale Range Inches	Graduations Inches
510-E2	0".006	0".0001
510-E4	0".0024	0".00005
510-E5	0".0014	0".00002
510-E6	0".0008	0".00001
510-E7	0".0004	0".000005
510-E8	0".0002	0".000002

C. E. JOHANSSON GAGE CO.

A DIVISION OF SWEDISH GAGE CO

10641 HAGGERTY AVE. • BOX 4086 NORTHEASTERN STATION • DEARBORN 1, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1231

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Lathes, Drill Presses, shapers, and pedestal grinders are featured in a South Bend catalog. Text with illustrations discusses features of the machine tools. One section has diagrams showing the floor space needed for the tools. Catalog 5406 is issued by South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind., or — **Inform-A-Gram No. B1.**

Mounted Wheels and Points are covered in a catalog from Bay State Abrasive Products Co., Westboro, Mass. They're used for portable disc grinding, snagging, and precision internal grinding. One section is devoted to a discussion of operating speeds and recommendations, complete with charts and illustrations. **Circle Inform-A-Gram No. B2.**

Yes! We guarantee that Class III threads (or better) can be cut with *every die head* and *every set of chasers* we ship . . . used either with or without lead screw control . . .

Write for the *FACTS* about Jones & Lamson's threading system of *"NO APPROXIMATIONS"*. Or, if you wish, a J & L field engineer will gladly give you the details.

RADIAL CHASER TYPE
Capacities from #8 to 4½"

TANGENT STATIONARY AND REVOLVING TYPE
Capacities from #4 to 2"

BROWN AND SHARPE TYPES
Capacities #0-1-¼" — for #00, #0 & #2 B & S machines & small turret lathes.

JONES & LAMSON

Class III Guaranteed — Not Sometimes, but Everytime!

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 1241

Eliminate Keys and Wrenches by using the new Hardinge-Sjogren speed collet chucks for both collets and step chucks. The chuck is available for tool room lathes, engine lathes, and grinders. The speed collet chuck is covered in a bulletin which also describes 5C Hardinge collets with 1-1/16" capacity, step chucks, and closers. Get Bulletin HS5 from Hardinge Brothers, Inc., Elmira, N. Y., or — **Circle No. B3.**

Production Threading of large nuts and other internally threaded parts is handled by the "Scru-Broach" machine with a hydraulic system. A bulletin contains illustrations of representative machine tools, and of parts produced by the "Scru-Broach" method. Bulletin 50054 explains the machine's operation and features. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Circle Inform-A-Gram No. B4.**

"Design Handbook of Stainless Steels" presents the mechanical and electrical applications of alloy metal wire, rod, and strip. A functional selection chart of Almet stainless steels and a discussion of their properties are included. One section is devoted to spring design with graphs and tables supplementing the discussion. In addition, consideration is given to special shaped wire, the heat treatment of these steels, and cleaning and passivating. H. K. Porter Co., Inc., Alloy Metal Wire Div'n, Prospect Park, Pa., or — **Circle Inform-A-Gram No. B5.**

"Space Saver" Magnetic Conveyors can convey ferrous parts and pieces up inclines as steep as 90° without the need for belt cleats. They automatically feed machines, stack parts, and perform parts turnover. Illustrations, descriptions, design features, operating advantages, and application possibilities for both the custom and standard series are contained in Bulletin MC-250 from The Homer Mfg. Co., Dept. 382, Lima, O. **Circle No. B6.**

Slicing, Drilling, Engraving, trepanning, shaping, and lapping can be performed by an ultrasonic impact grinder. A Raytheon bulletin discusses its applications, operating principles, and grinding performance. A description of the equipment is included together with illustrations and a specifications table. Raytheon Mfg. Co., 100 River St., Waltham 54, Mass., will provide copies of Product Data 2-332, or — **Circle Inform-A-Gram No. B7.**

A Transparent Grinding Fluid for grinding cast iron and steel has been announced by Cincinnati Milling Products Div'n. "Cimplus", a water-soluble concentrate, can also be used when machining cast iron. It gives exceptional rust control at dilutions between 1:100 and 1:200 and can be used as a water conditioner in a "Cimcool" mix. Since "Cimplus" is transparent at any dilution, it is ideal for precision grinding operations where it is necessary to see where the wheel is contacting the work. For full details, get Folder PC-322 from Cincinnati Milling Products Div'n, Cincinnati Milling Machine Co., Cincinnati 9, or — **Circle Inform-A-Gram No. B8.**

"Electrolimit" Jig Borers insure a new precision and productivity for a wide range of work sizes. They're capable of locating, boring, and checking to 0.0002" accuracy. Illustrations and specifications for each model, plus photos of their applications and features, are found in Circular 587 from Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or — **Circle Inform-A-Gram No. B9.**

Broaching Speeds Up To 300 FPM are possible with a new electro-mechanical drive horizontal broaching machine. It has optional dual speed and dual cycle. Details on the machine and its controls and fixtures are found in Bulletin SRHE from The Lapointe Machine Tool Co., Hudson, Mass., or — **No. B10.**

A 4-Slot Design which increases resistance to pull-out and provides greater protection against tool breakage is a feature of a new line of precision holding tools. The line which includes drill, reamer, and tap chucks is illustrated and described complete with size and dimensional information, in Bulletin 1-50. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Circle No. B11.**

Nine New OO-Size Screw Machine Tools are listed in a catalog from Brown & Sharpe Mfg. Co., Providence 1, R. I. These tools for automatic and hand screw machines feature maximum capacity, convenient adjustment, and rugged design. Included in Catalog S23 are the entirely new non-releasing and releasing tap holders, floating type; a thread roll holder; a boring tool holder with a micrometer adjustment; and a floating reamer holder with anti-friction bearings. **Circle Inform-A-Gram No. B12.**

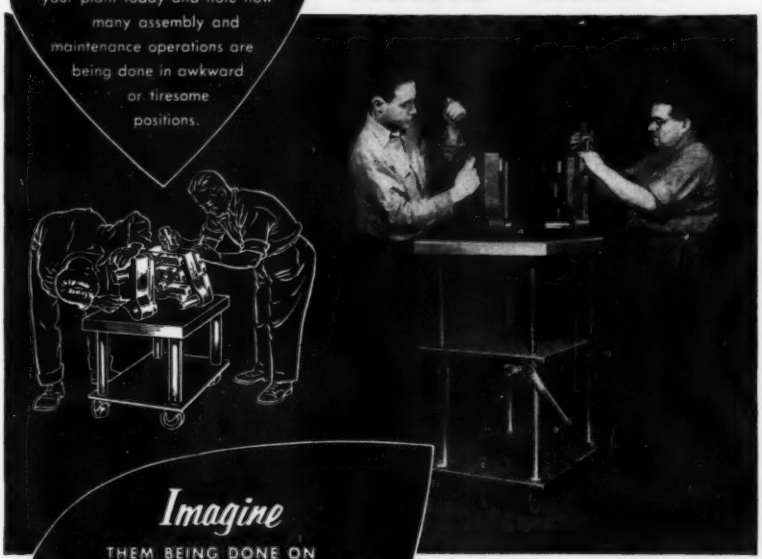
Flexibility, Accuracy, and Rigidity are incorporated into the Tree 2 UV vertical mill. Its features include an automatic collet closer, roller spindle drive, turret lock, and head-to-ram mounting. Further information is found in Catalog A55 which is supplied by Dept. A, Tree Tool & Die Works, 1600 Junction Ave., Racine, Wis., or — **Circle Inform-A-Gram No. B13.**

Automatically Straighten and Cut Wire on the 1 AV wire straightening and cut-off machine. It features a variable speed drive and electrically controlled target and clutch. Its capacity ranges from 3/32" to ¼" dia. basic wire and ⅛" spring wire. Details on the machine are in Bulletin 53 from Mettler Machine Tool, Inc., New Haven, Conn., or — **Circle Inform-A-Gram No. B14.**

8403

do you WASTE MONEY RISK ACCIDENT doing things the HARD WAY?

Take a trip through your plant today and note how many assembly and maintenance operations are being done in awkward or tiresome positions.



Imagine THEM BEING DONE ON PORTELVATOR®

THE HANDY HAMILTON PORTABLE ELEVATING TABLE

With Portelvator hundreds of assembly and maintenance jobs are accomplished at the *right height* and in the *best light*. And that means money in the bank and workmen on the job; faster work and fewer accidents.

Portelvator prices start at $155.00—place a couple at your workmen's disposal and watch results.

Complete description in FREE Bulletin No. P-5403.

WRITE FOR IT!

Address The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio

IT'S A *Hamilton Tool*

USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1251

An Engine and Toolroom Lathe, Model 280, is covered in a bulletin from The Springfield Machine Tool Co., Springfield, O. Its features are shown and discussed in Bulletin 201. **Circle Inform-A-Gram No. B15.**

"T-J Cutters" highlights the line of die sinking milling cutters produced by The Tomkins-Johnson Co., Jackson, Mich. Among the tools included are end mills; roughing, boss, ball, and angle cutters; and taper shank end mills. One section of Catalog 1055 is devoted to plastic and die casting mold cutters. **Circle Inform-A-Gram No. B16.**

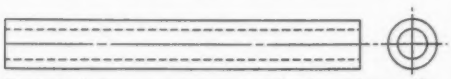
Hydraulic Keyseaters are the subjects of a flyer from Mitts & Merrill, Saginaw, Mich. The No. 2 and No. 3 machines are illustrated and discussed. They speedily machine straight keyways with a high degree of accuracy. **Circle No. B17.**

A Beam Compass is described in a circular from Ferance Construction Co., 28 Woodside Dr., Penfield, N. Y. It is to be used by engineers, designers, and layout men. Circles from 1" radius to 71" radius can be made quickly and easily. **Circle Inform-A-Gram No. B18.**

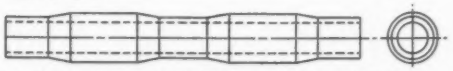
Swaging Success Stories

Inside Diameter Contours ... Easily Produced by Swaging

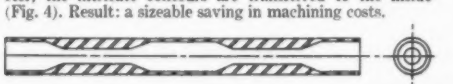
Machining multiple-diameter contours on the inside of cylindrical pieces (Fig. 1) is a difficult, time-consuming job.



Torrington's Swager experts start with tube of larger OD (Fig. 2) and machine the blanks to predetermined outside shape (Fig. 3).



Simply by swaging the outside to a straight, uniform diameter, the intricate contours are transferred to the inside (Fig. 4). Result: a sizeable saving in machining costs.



Swaging Advantages...

No Chips...No Waste...No Scrap

Swaging reduces metal—saves material—does not cut it away wastefully.

Swaging work hardens metal—gives it added strength, better finish and resiliency, dimensional accuracy.

Swaging is fast—can be done by unskilled workers to produce more pieces at lower cost.

Write for our informative booklet on Swaging that gives detailed descriptions of Torrington Rotary Swagers. It may show you how to achieve new savings in your own plant.

THE TORRINGTON COMPANY
Swager Department
6 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1261

Vertical Boring and Turning Machines, sizes 30", 36", and 46", are featured in a new King catalog. These machines are designed for boring, turning, and facing, or any combination of these operations, on all types of work. The catalog has sections giving specifications and optional equipment. Copies of Catalog K-5 are made available by American Steel Foundries, King Machine Tool Div'n, Cincinnati 29, or— **Circle Inform-A-Gram No. B19.**

Of Value in Die Designing and die making and/or die usage are copies of the "Die Set Digest". In the first issue is an article on how the modernized foundry assures better semi-steel die sets. Another discusses a unique production control system. The Producto Machine Co., 930 Housatonic Ave., Bridgeport 1, Conn., or — **Inform-A-Gram No. B20.**

Pin Clutch Component Parts and operating instructions are given in Catalog CL-1 from Ferracute. A diagram shows the end view and cross section of a positive clutch (for power presses), and instructions are given for taking the clutch apart. Also included is a drawing of a single stroke clutch assembly with an explanation of its operation. Ferracute Machine Co., Bridgeton, N. J., or — **Inform-A-Gram No. B21.**

A New Light Overhead Conveyor can round corners, and side-step posts, pillars, and other obstructions without the use of idle corners. The conveyor can carry 150 lbs. A bulletin describing the conveyor system and the infrared ovens is available from the manufacturer, Triangle Equipment Co., Inc., 45 River Rd., Nutley, N. J., or — **No. B22.**

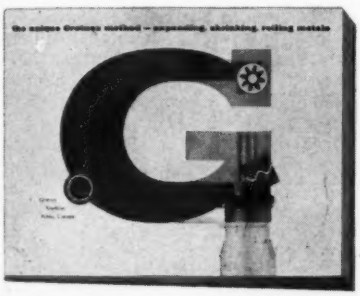
A Completely Automatic Heat Treating Unit handles six successive continuous operations. The "Unitline" can be included in an automatic production line or be made a part of a heat treating department. A folder covering the "Unitline" will be supplied by Ferguson Equipment Corp., 221 Corliss St., Pittsburgh 20, or — **Circle Inform-A-Gram No. B23.**

Solve Masking Problems with spray paint masks and masking specialties. A brochure lists the "Kwiky-Dot" overlapping masking disc sizes and custom shapes made from many types of pressure-sensitive tape. These time-saving masking devices are used in industrial product finishing departments. For a copy of the Spray Paint Masking Brochure, M-12, contact By-Buk Co., 4314 W. Pico Blvd., Los Angeles 19, or — **Circle Inform-A-Gram No. B24.**

The Nut You Can't Shake Loose is the Security "Locknut". It is a combination of a standard nut and retainer, fabricated into a single standard nut. The "Locknut" can be removed and replaced as often as necessary without loss of locking effect or damage to the bolt. Details on the "Locknut" and its features are found in a brochure issued by the manufacturer, Security Locknut Corp., North and 15th Aves., Melrose Park, Ill., or — **No. B25.**

Drill Up To 8 No. 25 Holes or tap up to 8 No. 10-32 holes in mild steel with the Cleveland Jr. multi-spindle drill-tapper. It performs the operations accurately, efficiently, and economically. Complete details including specifications and work pattern are found in a bulletin from The Cleveland Tapping Machine Co., Canton 6, O., or — **Circle No. B26.**

The Principles of Forming Metal Parts by a unique method are explained in a new booklet. The Grotnes method is an integrated metalworking technique for the forming and/or sizing of continuous metal parts by expanding, shrinking, and rolling or by a combination of these operations. Considerations of the practical applications of the method are also made. Grotnes Machine Works, 5454 N. Wolcott Ave., Dept. 88-89, Chicago 40, or — **Circle Inform-A-Gram No. B27.**



Cut Abrasive, Tough and Hard Materials quickly and easily with carbide midget mills. The complete Severance line is listed in a new bulletin which gives a revised price list. Also shown are carbide "Econo-Sinks" complete with dimensions. Get Bulletin 22-ES from Severance Tool Industries, Inc., 730 Iowa St., Saginaw, Mich., or — **Circle No. B28.**

Solve Heavy Moving Problems with the "Mighty Mover". One man can quickly and easily move heavy machinery. Skids, pipes, blocks, wrenches, and cables are eliminated. A brochure from Mighty Mover Co., 1482 S. Milwaukee St., Denver 10, contains the details on the "Mighty Mover," or — **No. B29.**

"What Is a Forging?" describes how the forging idea originated, how forgings are made, and the part forgings play in everyday products. The discussion is supplemented with illustrations. Drop Forging Association, 419 S. Walnut St., Lansing 33, Mich., or — **Circle No. B30.**

Information for Specifying Springs is given in a new brochure issued by Automatic Spring Coiling Co., 4045 W. Thorndale Ave., Chicago 30. Descriptions and photos of applications and the company's fa cilities are given in addition to details for specifying compression, torsion, extension, flat, and power springs. Also included is a concise, basic list of spring terminology. **Circle Inform-A-Gram No. B31.**

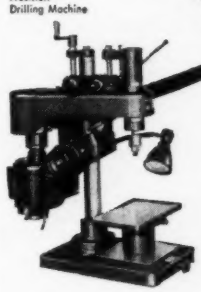
Seven Attachments make the Kidder "Little Blacksmith" No. 55 machine a versatile piece of equipment for the metalworking shop. Available attachments include angle shear, punching, notching, bending, etc. They're described in a circular supplied by J. F. Kidder Mfg. Co., Inc., 426 Colchester Ave., Burlington, Vt., or — **Circle Inform-A-Gram No. B32.**

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 1/16" in all drillable materials) is super sensitive. Provides speeds, infinitely variable, between 840 R.P.M. and 9300 R.P.M. Is built to precision tolerances, and with the stamina to retain precision.

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ASK FOR FREE BULLETIN 5408

Address The Hamilton Tool Company
832 South Ninth Street
Hamilton, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1271

How 'Dag' Colloidal Dispersions can cut costs in a variety of metal working operations is described in an Acheson Colloids bulletin. 'Dag' colloidal graphite is effective in forging, extrusion, punching, spinning, cutting, etc. because of its excellent lubrication qualities and high resistance to heat. The methods of application and the diluent ratios of 'Aquadag', 'Glydag', 'Oildag', and 'Prodag' are also given. Copies of Bulletin 426 are available from Acheson Colloids Co., Port Huron, Mich., or — **Circle No. B33.**

Accurately Rebuilt Tools are produced by J. L. Lucas & Son, Inc., Bridgeport 5, Conn. A bulletin commemorating the company's 50th anniversary lists, illustrates, and discusses the steps in rebuilding machine tools. **Circle No. B34.**

Holes from ⅜" to 1½" Dia can be produced by the "Tru-Hole Jr." boring bar. Sets of ten and fourteen tools are available. Specifications are given in a bulletin from E. F. Vilter Sales Inc., 4161 N. Richards St., Milwaukee 12, or — **Circle Inform-A-Gram No. B35.**

The Complete Capacity Range of Danly double-action straight side presses, with the latest improvements, is shown in a new catalog. These presses range from 200 to 2000 tons capacity. Specifications in chart form include capacity in tons, number of connections, bed size, effective draw, stroke, horsepower, shut height, slide adjustment, and bed opening. Graphs illustrate standard motion cycle, eddy current clutch slow down cycle, and mechanical slow down cycle. For copies of Series D Catalog, contact Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or — **Circle Inform-A-Gram No. B36.**

Construction, Dimensions, Capacities, housing, and tolerance fits are given on the complete line of Orange roller bearings in an engineering reference manual. Roller bushings, journal roller bearings, cam yoke rollers, staggered roller bearings, full and cage type needle bearings, cam followers, and thrust roller bearings are covered. Reference Manual M-55 is available from Orange Roller Bearing Co., Inc., 557 Main St., Orange, N. J., or — **Circle Inform-A-Gram No. B37.**

"Automatic Sizing for Bryant Internal Grinders" tells how to maintain constant high production rates needed to coordinate production lines. These internal grinders with automatic sizing will grind and size bores to extremely close tolerance. The advantages of such sizing, an air sizing schematic block diagram, and diagrams of solid plug and automatic diamond sizing cycles are included in the bulletin from Bryant Chucking Grinder Co., Clinton St., Springfield, Vt. **Circle No. B38.**

Heavy-Duty General Purpose Steel Spring Vibration Mountings are described in a catalog released by T. R. Finn. "Finnflex" Type SB vibration mounting insures maximum shock absorption, vibration isolation, and noise reduction. The construction details, methods of damping excursion and controlling sway and thrust, load capacities, and dimension tables are included in Catalog SS-55. T. R. Finn & Co., Inc., Industrial Div'n, 200 Central Ave., Hawthorne, N. J., or — **Circle Inform-A-Gram No. B39.**

"Super Alloys" presents the physical properties and processing data of a group of high strength heat and corrosion resistant materials for jet engines, gas turbines, turbo-superchargers, etc. The bulletin contains many graphs, tables, charts, and illustrations. Also included are notes on the tables and charts, explaining them. Universal-Cyclops Steel Corp., Bridgeville, Pa., or — **Circle Inform-A-Gram No. B40.**

Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cut-off from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

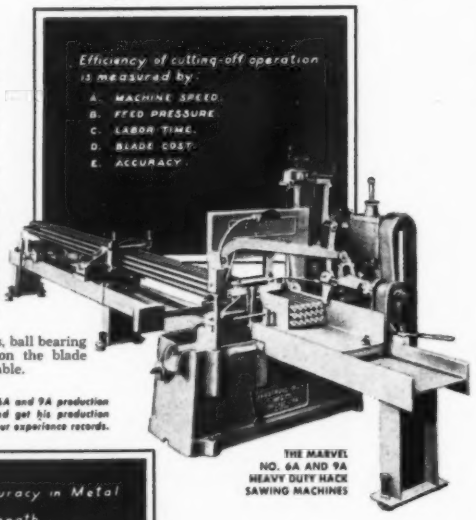
A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.

B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.

C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.

D. Use a non-breakable high speed hack-saw blade—the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.

E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.



If you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.

THE MARVEL NO. 6A AND 9A HEAVY DUTY HACK SAWING MACHINES

Formula for Accuracy in Metal Sawing
ACCURACY = (Length, Straightness, Squareness)
Straightness, Squareness = (Blade Rigidity, Blade Tautness)
MARVEL
HIGH-SPEED EDGE
ARMSTRONG-BLUM MFG. CO.
CHICAGO 22 MADE IN U.S.A.

Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL High-Speed-Edge Hack Saw Blades and Hole Saws.

The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts any machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively **unbreakable.** These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

MARVEL SAWS — Metal Cutting — Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1281

Faster Drying, Non-Toxicity, and non-flammable are features of "Manpro" cold cleaners. These five cleaners are excellent for a variety of metal cleaning operations. A complete performance and property bulletin is offered by the producer, Manufacturers Processing Co., 1360 Hilton Rd., Detroit 20, or — **Circle Inform-A-Gram No. B41.**

Self-Contained Drill and Tap Units, and index and power feed units are detailed in a general catalog. A fold-out section presents a wiring diagram for all the units. In addition, the catalog covers special multi-operation machine tools and needle bearing assembly machines. Rhenberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill., or — **Circle Inform-A-Gram No. B42.**

Drafting Room Furniture and equipment is covered in a new catalog. Among the items included are t-squares and straightedges, ruling attachments and drawing tables, and

plan files. Each is illustrated and described. For copies of Catalog 8A, write to Mayline Co., Inc., Sheboygan, Wis., or — **Circle No. B43.**

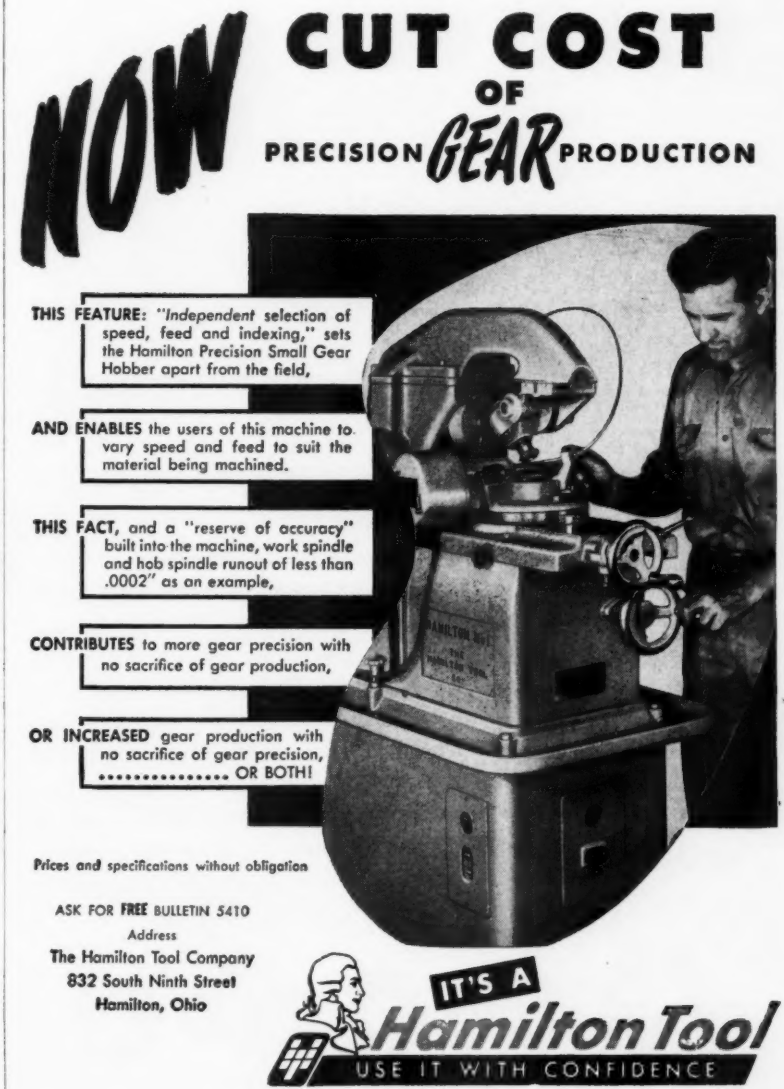
Milling, Boring, and Duplicating are handled by the "Mastermil". This high-speed vertical milling machine features super-speed spindles, an infinitely variable table feed, and anti-backlash adjustment. A bulletin with details on the machine is available from George Gorton Machine Co., Racine, Wis., or — **Circle Inform-A-Gram No. B44.**

"Automatic Machine Feed Units" shows a manufacturer how to build his own transfer machine using present equipment. A diagrammatic story of oriented automated vertical storage is presented. A two-page diagram shows automatic stock handling in a gear processing line. Other illustrations show the equipment that is available from F. Jos. Lamb. Co., 6343 Wight St., Detroit 7. **Circle Inform-A-Gram No. B45.**

Infinite Zone Control to 2000°F and 2300°F is a feature of "Dyna-Trol" industrial electric furnaces. Special models and over 40 standard ones are available. More information on these furnaces is found in Bulletin 12-53 from L and L Mfg. Co., Chester, Pa., or — **No. B46.**

Meletron Pressure Switches are highlighted in the Barksdale Design Handbook & Catalog. A chart tells how to select the correct model for a specific application. Each model is illustrated and described complete with a list of its features and operating characteristics. A section in the back of the catalog presents engineering data. Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, or **Circle Inform-A-Gram No. B47.**

High Frequency Wheelheads are the subject of a Bryant bulletin. They give speeds ranging from 10,000 to 100,000 rpm, finer finishes, and greater power. Complete information on the Series 800 Wheelheads is found in a bulletin from Bryant Chucking Grinder Co., Springfield, Vt., or — **Circle Inform-A-Gram No. B48.**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THIS FEATURE: "Independent selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,
AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.
THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,
CONTRIBUTES to more gear precision with no sacrifice of gear production,
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USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1291

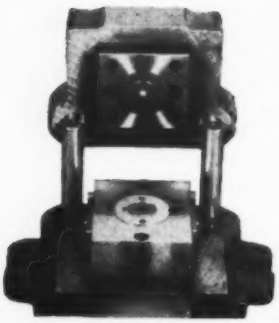
Effective for Slotting Operations is the Illinite "Tri-Mil" end mill. This versatile end mill is extra rigid and easily sharpened. Ordering information and further details are found in a brochure supplied by Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, or — **No. B49.**

New Extrusion Items are offered in the revised edition of the "Beryl-co Product Directory". In addition to extruded rod and bar stock, seamless beryllium copper tubing in redraw sizes is included. The twenty-page directory lists and describes the characteristics of beryllium copper, beryllium aluminum, and beryllium nickel alloys; beryllium copper safety tools; and beryllium metal and oxide. The Beryllium Corp., Reading, Pa., or — **Circle No. B50.**

Replace Lapping by using the Sunnen external hone for finishing external diameters. It combines the precision of lapping with the speed of honing. Complete information is given in a bulletin available from Sunnen Products Co., 7910 Manchester, St. Louis, Mo., or — **No. B51.**

"HOVIS WASHER DIES have sure solved our troubles!

"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



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VAN DYKE, MICHIGAN — Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 1301

Simplify the Measurement of Surface Roughness with the "Surfindicator". The new gage checks a wide range of surface shapes, including small inner diameters. This portable inspection tool is accurate, simple to operate, and can be used anywhere. For more information, get Form ED-21702 with catalog sheets from Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, or — **Circle Inform-A-Gram No. B52.**

"Dumore Precision Tools" covers a complete line of tool post grinders, hand grinders, automatic drilling equipment, drill grinders, and accessories. The catalog contains many technical and application illustrations and charts for determining the proper accessories for various types of grinding machines and operations. Copies of Catalog 55-FL may be obtained by writing to Dumore Precision Tools, 1300 — 17th St., Racine, Wis., or — **No. B53.**

"Developments in Numerical Control" discusses the method and its advantages. Also covered are applications of the machine which can translate operating information into mechanical action without human intervention. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., will supply copies of Circular 591. **Circle Inform-A-Gram No. B54.**

High-Pressure Hydraulic Cylinders are detailed in an S-P catalog. Photos and diagrams of the models available are given. Several charts present hydraulic pressure and flow data, and the dimensions for the cylinders. Catalog 104 also contains a full page illustration showing the cylinder's design features. The S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6, or — **Circle Inform-A-Gram No. B55.**

"Molds for Plastic and Die Casting Dies" presents case histories of molds for plastics that have been designed by The Parker Stamp Works, Inc., Hartford, Conn. The company offers injection, compression, plunger, and transfer molds; and a complete engineering service. Also shown in the folder are a few of the many die parts produced from Parker-built dies. **Circle No. B56.**

Measure 0.000001 to 0.0002" with a new comparator micrometer that requires no contact with the measured piece. Model 103 may be applied to a wide variety of dimensional gaging problems. The T-42 ionization transducer makes capacitive gaging practical. For Data Sheet 103-1 giving the complete details, contact Decker Aviation Corp., 1361 Frankford Ave., Philadelphia 25, or — **Inform-A-Gram No. B57.**

A New Method of Mounting Diamonds permits the use of stones 2/3 smaller than previously used. Under the Permattach process, the diamond is chemically "wetted" and welded to the tool shank instead of held by a mechanical union. It can be used to mount diamond on wheel dressers, boring tools, etc. Read all about the process in the bulletin, "Diamond Tools", issued by Permattach Diamond Tool Co., Inc., Milford, N. H., or — **Circle No. B58.**

How An Automatic Production Line Machines 400 Cylinder Heads/Hr is described in a new 7-page fold-out brochure. Four W. F. & John Barnes "Progress-Thru" machines are pictured. Schematic line drawings extending across the whole brochure present in detail the operating sequence of one line. Such automatic mass machining methods reduce costs and increase efficiency. W. F. & John Barnes Co., Dept. P-TM, 301 S. Water St., Rockford, Ill., or — **Circle Inform-A-Gram No. B59.**

A Front-To-Back Crankshaft Design is featured on Niagara Series E single point open back inclinable presses. A new bulletin discussing the presses includes die space dimension drawings and specifications.

Bulletin 56 covering the 75- to 200-ton line which is available in standard and automatic models, is supplied by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or — **Inform-A-Gram No. B60.**

Applications of Tubular Products in the process industry are presented in a new folder issued by the Tubular Products Div'n, The Babcock & Wilcox Co., Beaver Falls, Pa. A complete listing of the type of tubing produced and a brief description of the kinds of technical literature available are also given. In addition, Folder TB-408 contains a table of chemical analyses, physical properties, mechanical properties, and creep strength of 20 steels. **Circle Inform-A-Gram No. B61.**

A Precision Grinder designed to generate parallel and flat surfaces on a variety of small parts is the subject of a new catalog. The features of the grinder are illustrated and explained. For copies of Catalog 2V-55 describing the 2V 18 double disc grinder, write to Gardner Machine Co., Beloit, Wis., or — **Circle Inform-A-Gram No. B62.**

A Redesigned Line of tap holders and drivers is presented in a bulletin offered by Scully-Jones. Included is specification and application information on heavy-duty tap holders, close center tap drivers and chucks, and the new line of "JT" compression and tension tap holders of the lock-and-eject type. Copies of Bulletin 4-50 may be obtained from Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Circle Inform-A-Gram No. B63.**

Standard Conveyors are highlighted in Catalog 309 from Standard Conveyors Co., North St. Paul 9, Minn. The complete line of gravity and power conveyors and pneumatic tube equipment is presented. Actual applications of the equipment are shown and explained. **Circle Inform-A-Gram No. B64.**

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3P
IMMEDIATE DELIVERY of 3-P Punches and Die Buttons is made possible because over 37,000 Standard sizes are in STOCK. In fact, Porter Precision Products are stocked in all principal cities.
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The 3-P catalog can save you thousands of dollars. It contains a perfect pair — to answer every piercing need. PORTER head PUNCHES and DIE BUTTONS are made from three types of finest tool steel, and are offered in any DECIMAL size.
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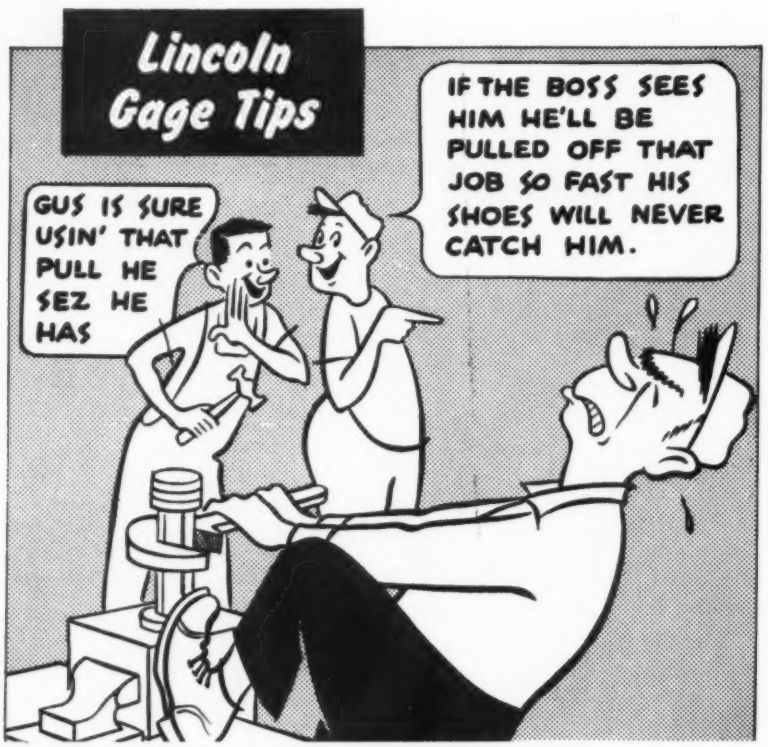
CIRCLE INFORM-A-GRAM KEY NO. 1311

Easier, Quicker Setups are possible using Universal vises and work-holding fixtures. The company's entire line of work-holding tools is described in a new catalog. Universal Vise & Tool Co., Parma, Mich., will supply copies of Catalog 9155, or — **Circle No. B65.**

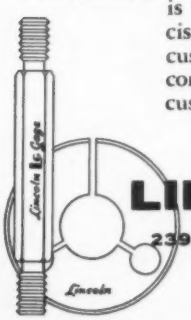
The First Comprehensive Proving Ring Catalog has been issued by Morehouse Machine Co., 233 W. Market St., York, Pa. Bulletin 116 covers proving rings certified to National Bureau of Standards specification LC-822. The bulletin describes and diagrams the working principles of both compressed-type and tension-type proving rings. Typical applications are also pictured and discussed. **Circle No. B66.**

"Select-O-Matic" Roll Feeds are highlighted in a folder from Carl G. Peterson Co., 9 Warren Ave., E. Providence, R. I. These versatile feeds have quick reverse of feed and positive indexing. A lock-out feature holds the rolls apart for manual feeding of strip and a flip latch engages automatic feeding. **Circle Inform-A-Gram No. B67.**


Lincoln Gage Tips
GUS IS SURE USIN' THAT PULL HE SEZ HE HAS
IF THE BOSS SEES HIM HE'LL BE PULLED OFF THAT JOB SO FAST HIS SHOES WILL NEVER CATCH HIM.

DON'T USE FORCE, you will ruin a precision measuring tool. If the proper gage, particularly a Lincoln gage, does not enter the hole smoothly, there is some operation along the production line that needs correcting.

Thread gages are ground and lapped to extremely close tolerances; sometimes as close as .00005 of an inch. We at Lincoln Gage feel it a privilege to produce plug and ring gages for our customers. That is why we try to make each one a masterpiece of precision workmanship. And we believe that is why our customers continue to do business with us. We would consider it a privilege to count you among our satisfied customers.



LINCOLN GAGE CO.

23900 HARPER AVE., ST. CLAIR SHORES, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1321

Ball Bearing Screws and Splines are featured in a comprehensive 32-page catalog. Ball bearing screw assemblies are fully discussed, complete with graphs, charts, and illustrations. Typical custom and standard assemblies are shown. The operating principle of ball bearing splines and their features are also explained. For copies of the catalog, contact Saginaw Steering Gear Div'n, General Motors Corp., Saginaw, Mich. or — **Circle No. B68.**

Forty-Two Colloidal and Semi-Colloidal Dispersions are listed in a revised four-page booklet. Included are dispersions of graphite, molybdenum disulfide, mica, zinc oxide, etc. They're used for operational functions, maintenance, lubrication, and machine design. Acheson Colloids Co., Div'n of Acheson Industries, Inc., Port Huron, Mich., or — **Circle No. B69.**

Eliminate Waste in Drills and Drilling with Worcester Drill Grinders. They will sharpen accurately 2, 3, or 4 lip drills, flat twisted drills, and flat or chucking drills. They have a drill holder with short, stiff connections for accuracy. Further details on the grinders are found in Bulletin 255 from Edward Blake Co., Inc., 437 Cherry St., W. Newton 65, Mass., or — **Circle Inform-A-Gram No. B70.**

No Steam Boilers or Air Compressors Are Needed with the Nazel electro-pneumatic hammer. The hammer is a double-acting compressor driven by a directly geared motor. It is used to forge flats, flutes, tapers, and square nuts. Lobdell United Div'n, United Engineering and Foundry Co., Wilmington 99, Del., will supply a catalog with details on the hammers. **Circle Inform-A-Gram No. B71.**

Steelweld Press Brakes and their construction details are described and illustrated in a new catalog. Dimensions and specifications are given for the entire standard line of press brakes. The brakes range in bending capacity to 14' x ¾" mild steel. The Cleveland Crane & Engineering Co., 1042 E. 289th St., Wickliffe, O., will provide copies of Catalog 2010-H. **Circle No. B72.**

The "Simplimatic" Automatic Lathe is suited for medium to long runs. Its features include automatic headstock lubrication, a wide choice of spindle speeds, and electric controls. For further details on the "Simplimatic", its features and applications, get Catalog 1159-A from Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis., or — **Circle Inform-A-Gram No. B73.**

Automatic Loading and Gaging of mass produced parts are performed by the new Barber-Colman 3-6 vertical hobbing machine. It has wide application for hobbing speedometer and transmission gears, starter pinions, appliance gears, and drive gears up to 3" dia x 6" face width. Read all about the machine in a bulletin from Barber-Colman Co., Rockford, Ill.
Circle Inform-A-Gram No. B74.

"Die Springs" describes the development of a new line of die springs in three distinct pressure groups and over 500 standard sizes. The complete line of Bliss-Dieco die springs is presented. Also included are performance statements, dimensions, and illustrations. Copies of Bulletin 72 are available from Die Supply Div'n, E. W. Bliss Co., 1400 Brookpark Rd., Cleveland 9, or —
Circle Inform-A-Gram No. B75.

A New Duplex Vertical Precision Boring Machine is introduced in an Ex-Cell-O bulletin. Boring, facing, grooving, and chamfering can be performed alone, or in any combination on the Style 432 machine. Specifications, operating data, and a general description are found in Bulletin 31356 from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or —
Circle Inform-A-Gram No. B76.

High and Low Temperature Cabinets are used for shrink fitting of metals, stabilization of steels, hardening of metals, and rivet storage. The temperature ranges are from +300°F to −200°F with an accuracy of ±0.2°F. Details on the cabinets are found in a bulletin from Webber Engineering Corp., Dept. B-299, P. O. Box 217, Indianapolis 6, or — **Circle Inform-A-Gram No. B77.**

The Westberg Colletmandrel will grip in a hole as small at 3/16". It works in any machine or fixture that uses collets and can be machined to suit all diameters and forms within its limitations. The bulletin, "Westberg Colletmandrel", giving specifications and application data is supplied by Erickson Tool Co., E. 23rd & Hamilton Ave., Cleveland 14, or — **Circle No. B78.**

"Stainless Steel Fastenings" are highlighted in a new catalog. Among the fastenings covered are machine screws, hexagon head cap screws and bolts, socket head cap screws, cap and wing nuts, rivets, lock and flat washers, etc. This catalog presents a complete price and stock list. Anti-Corrosive Metal Products Co., Inc., P.O. Box 870, Albany, N. Y., or — **Circle No. B79.**

Cut Tooling Costs with eight types of chuck jaw blanks that are covered in a folder produced by Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland. They're designed to fit over 90% of the chucks manufactured. The folder illustrates the six steps eliminated in the average tool room when Jergens chuck jaw blanks are used from stock.
Circle Inform-A-Gram No. B80.

Buffing and Polishing Compounds are featured in a bulletin issued by Hanson-Van-Winkle-Munning Co., Matawan, N. J. Included is a recommendation chart and index, principal classifications of buffing compounds, illustrations, and a list of the characteristics and uses of the various compounds. One section of Bulletin CO-103 is devoted to "Liquimatic" application equipment.
Circle Inform-A-Gram No. B81.

Dial Indicator Gages for dimensional control are presented in a new catalog. Facts are given about the gages and gaging. Each model is illustrated and explained. Catalog 55G is issued by Federal Products Corp., 1144 Eddy St., Providence 1, R. I., or —
Circle Inform-A-Gram No. B82.

Dickerman FEEDS PROFIT INTO ANY PRESS OPERATION!

Get faster production, constant performance, lasting accuracy with the feed that outlasts the die itself!

Whether you calculate unit profit by pennies or dollars, you can make more in less time with Dickerman Automatic Stock Feeds. Dickerman feeds operate 24 hours a day, if necessary — with no overtime — no fatigue — no production let-down — no chance of human error. Add automation to your press work — reduce unit costs — eliminate rejects — feed generous profits into every stamping operation! Twelve standard Dickerman feeds handle virtually any stock at any speed the tooling will withstand!

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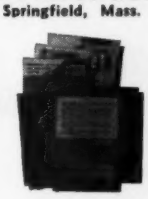
H. E. DICKERMAN MFG. CO.
324-207 Albany St., Springfield, Mass.

Send today for information on the complete Dickerman line.



Here is one of the thousands of 6" Dickerman Die Feeds that is producing profits for progressive manufacturers daily!

CIRCLE INFORM-A-GRAM KEY NO. 1331

The "Power-Pack" Air Cylinder features built-in cartridge valve and speed controls. It can be hooked up easily for solenoid or poppet control, attached or remote. A bulletin contains diagrams of the valve, illustrations of the models available, and operating data. For Bulletin 125, contact Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill., or — **Circle Inform-A-Gram No. B83.**

Turn Diameters from a needle to a turbine shaft in one cut with the Karge "Turnomat". This centerless, one pass lathe attachment turns straight, tapers, and contours. This attachment is made in four sizes to turn parts from bar stock from 1/16" to 3½" dia. Details are given in literature supplied by Turnomat Co., Inc., Brockport, N. Y., or — **Circle Inform-A-Gram No. B84.**

For Easier Drilling and higher production, use the "21" Cincinnati stationary head floor drill. The drill has a depth gage with a positive stop to disengage the feed automatically. For details on the drill and its specifications, get Catalog D-142 from Cincinnati Lathe and Tool Co., Cincinnati 9, or — **Circle Inform-A-Gram No. B85.**

Are Your Tool Grinding Practices UP-TO-DATE?

How many holes before this drill will have to be resharpened again? 100 pieces per sharpening or 200 — it all depends on the quality of the sharpening job you do. R-O form relief leaves metal behind the edge to support it and dissipate heat. The edge stands up longer, the tool lasts longer and production costs drop correspondingly.

RO
UNIVERSAL FORM RELIEVING FIXTURE

Produces radial or axial relief only or any combination of the two on taps, step drills, profile mills, reamers, etc. Operation has been completely simplified. For maximum versatility use with the R-O Grinder.

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GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
29800 STEPHENSON HY. ROYAL OAK, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1341

A Specifications Manual on the Holmes combination hydraulic forcing and straightening press is now available. This press will perform broaching, bending, forming, punching, slotting, etc. operations. The manual contains illustrations, features, and construction details of the press. Also included are engineering data and formulas, diagrams, and specifications. For copies, contact Stanley H. Holmes Co., 3300 W. Lake St., Chicago 24, or — **Circle Inform-A-Gram No. B86.**

A 50-Ton Multiple-Motion Powder Metal Press provides ease of setup and high-speed production of complicated parts. Model 640 makes possible the application of powder metallurgy to the production of parts for which the process hadn't been economical. Its features include centralized controls, a secondary upper punch, and maintenance-free design. Bulletin 670 from F. J. Stokes Machine Co., Philadelphia 20, contains all the details. **Circle Inform-A-Gram No. B87.**

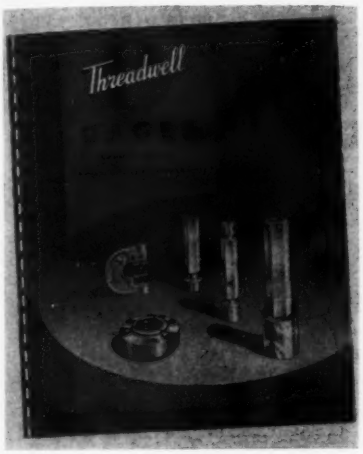
Production and Processing of Made-to-Order Metals in experimental quantities is discussed in a 16-page booklet. The facilities of the complete pilot plant of Hamilton Watch are described. The plant produces small 10-lb ingots by regular or vacuum melting, and forges, anneals, heat treats, rolls, and draws the resultant metal. For copies of the booklet, "Precision Metals Service", contact Hamilton Watch Co., Allied Products Div'n, Lancaster, Pa., or — **Circle Inform-A-Gram No. B88.**

Reduce Costs by using "Magna-Tip" magnetic screw holding accessories for power screw drivers and nut setters. They eliminate prepositioning screws for driving and permit faster driving in inaccessible locations. A new catalog contains general information and ordering data on the complete line of accessories. Magna Driver Corp., Washington and Goddell Sts., Buffalo 3, will provide copies of the catalog, or — **Circle Inform-A-Gram No. B89.**

The "Grav-O-Matic" automatic gravity casting machine is now available for lease. It features automatic temperature control, pouring control, and casting cycle. It is designed for do-it-yourself casting in the manufacturer's plant. The castings have a higher tensile strength plus a grain structure equivalent to a forging. Read all about the machine in literature from Automation Engineering Corp., 1127 Wilshire Blvd., Los Angeles 17, or — **Circle Inform-A-Gram No. B90.**

A Swaged Hose Assembly Catalog has been issued by The Weatherhead Co., 128 W. Washington Blvd., Fort Wayne Div'n, Fort Wayne, Ind. Catalog S-1 shows the complete line of Weatherhead swaged hose, hose ends, and adapters available through the "Right-Now" swaged hose assembly service. Also featured is a detailed swaged hose assembly numbering system.
Circle Inform-A-Gram No. B91.

Threadwell Limit-Type Gages are featured in a new catalog. Various sections detail the gages available—cylindrical plug, taper, cylindrical ring, adjustable limit, thread, and pipe thread. Other sections are devoted to thread production and checking equipment and engineering data. For each type of gage, the features, size range, dimensions, a description, ordering information, and price list are given. Also presented



are tolerance tables and a discussion of gagemakers' tolerance for plain cylindrical plug and ring gages. In addition, a list of thread gage terms is given. One of the tables included is a double-page one telling how to calculate limit plug and ring dimensions of thread gages. Copies of Catalog G55 are by Threadwell Tap & Die Co., Greenfield, Mass., or — **Circle Inform-A-Gram No. B92.**

A Use Manual provides the necessary information for the practical application of Orchard VPI materials for the protection of ferrous metal surfaces or products from corrosion. The materials are available in rolls, sheets, bags, etc. Their handling is discussed in terms of storage and safety. The general methods of using VPI materials are detailed and the requirements per package given. Also included are examples of specific uses of these materials. In addition, an application chart and specifications are presented. Get Technical Sales Bulletin No. 54-7 from Orchard Paper Co., St. Loius 15, Mo., or — **Circle No. B93.**

Open-Back Inclinable Presses, 10 to 200 tons, are highlighted in a new Bliss catalog. The special features and design of the presses and the attachments available are discussed. There are also sections dealing with the Bliss line of clutches, automatic feeds, and die cushions. Catalog 2D is available from E. W. Bliss Co., Canton, O., or — **Circle No. B94.**

Air-Powered, Reversible, and Lightweight are some of the features of the new Rotor J-2 impact wrench. With this wrench, there's no slotting shock. It has a ¼" rated capacity for nuts, bolts, and cap screws. For full details, get Bulletin 41 from Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, or — **Circle No. B95.**

Forty-Nine Models of two wheel and platform trucks, twelve types of dollies, and fifteen styles of casters are illustrated and described in a new catalog. In addition, the unusual application of balance style trucks to trailer-truck operations is shown. Nutting Truck and Caster Co., Fairbault, Minn., will supply copies of Jr. Catalog 56G, or — **Circle Inform-A-Gram No. B96.**

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COMBINATION CRADLE AND STRAIGHTENER

Power driven rolls or conveyor, cradles coil stock. Straightener unit provides individual adjustment on upper pinch and straightener rolls. Positive aligning wedge mechanism is employed to adjust rolls. Loop control arm regulates flow of stock. The Unit is sturdy and reliable.

Sesco will furnish equipment to meet your specific requirements.

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Sesco INC. 8881 Central Detroit 4, Mich.

engineers & manufacturers of machine tools and press room equipment

CIRCLE INFORM-A-GRAM KEY NO. 1351

Advantages of Silver Alloy Brazing Preforms

There are two methods for applying the filler metal to the joint when brazing: (1) hand feeding the filler metal into the joint when the assembly reaches brazing temperature; (2) preplacing the filler metal in the joint during assembly and then heating so that the filler metal melts in place. With hand feeding, the filler metal is introduced from a length of wire or rod. With preplacement, the filler metal is cut and shaped into a preform to conform to joint contours. The choice between the two methods depends on the particular production situation. Handy & Harman, manufacturer of silver alloy filler metals and fluxes for brazing, offers the following information as a guide for evaluating these two methods.

Hand feeding is usually done only with hand-torch brazing. Some of the factors which dictate the use of hand feeding are the production rate, the geometry of the part, and the size of the joint. For example, there may be no shoulder or groove where the preform can be placed. Or, the parts may be so small, such as small diameter tubing, that preforms would be too delicate to handle. Or, the shape of the parts may be so irregular that it would be too difficult or wasteful to fabricate the preforms. Also for low production or short varied runs, it may be impractical to purchase or fabricate preforms when one or two sizes of rod or wire could fill a variety of brazing requirements. However, before adopting the hand feeding method, the use of preplaced preforms should be carefully considered.

Preplacement of the brazing filler metal offers many advantages, provided production volume is high enough to justify the cost of fabricating preforms. Some of these advantages are:

1. Permits choice of any type of heating method, including hand torches, conveyors or rotary tables with fixed burners, induction heaters, furnaces, and others. Thus it opens the way to mass production brazing and lower joining costs. (Figs. 1 and 2).

Fig. 1. Mass production joining is one of the big dividends from preplacing the brazing filler metal. Here, 40 joints are being brazed simultaneously on the return bends of a heat exchanger, using rings of silver alloy filler metal preplaced on each end of the semi-circular bend.

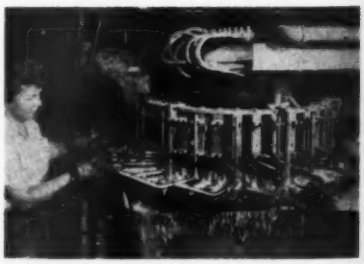

Fig. 2. Another machine brazing setup utilizing preplaced filler metal. On this automatic indexing machine, bicycle handlebars are brazed to tubular stems as the table rotates past the fixed burners at right background. The operator merely removes the brazed assemblies and replaces them with others to be brazed.

Grind EXACT SPIRAL POINTS with the BLAKE Flute Grinder

IN YOUR TAPS, as in lathe tools or milling cutters, correct rake angle on each cutting edge is all-important!

Grinding spiral points in taps demands exact indexing plus controlled shape of the flute to insure positive rake angle:

1. At the root of the first chamfer tooth.
2. At the crest of the last chamfer tooth.

The BLAKE FLUTE GRINDER gives you precise control of these important angles, both in the flutes and spiral points. It lets you grind the exact rake angle for best cutting in each material you tap.

It will pay you to investigate.

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BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDERS

CIRCLE INFORM-A-GRAM KEY NO. 1361

2. Gives accurate control over the quality of filler metal used per joint, thereby assuring filling the joint without waste.
3. Puts the filler metal where it's needed, thereby assuring uniformity and fewer rejects. For example, on joints having a large surface area or having a deep socket, preplacement assures that the filler metal flows into the less accessible parts of the joints.
4. Eliminates the need for skilled operators. The automatic heating methods made possible by preforms produce joints of consistent quality using operators who have to be trained merely to assemble the parts and tend the machine.

Silver alloy filler metals can be preformed into a wide variety of shapes (Fig. 3). They may be in the form of: (1) wire rings or pieces of wire or rod bent to shape; (2) shims or thin sheet stock cut or stamped into squares or slugs; (3) flat washers or discs stamped from sheet; (4) coined washers stamped from rings of wire or of thin rod.

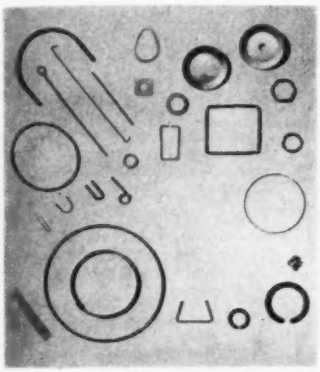


Fig. 3. Some of the many shapes of preforms which can be tailored for specific applications from silver alloy filler metals. The excellent ductility of these filler metals permits fabricating many shapes of preforms right in the brazing shop.

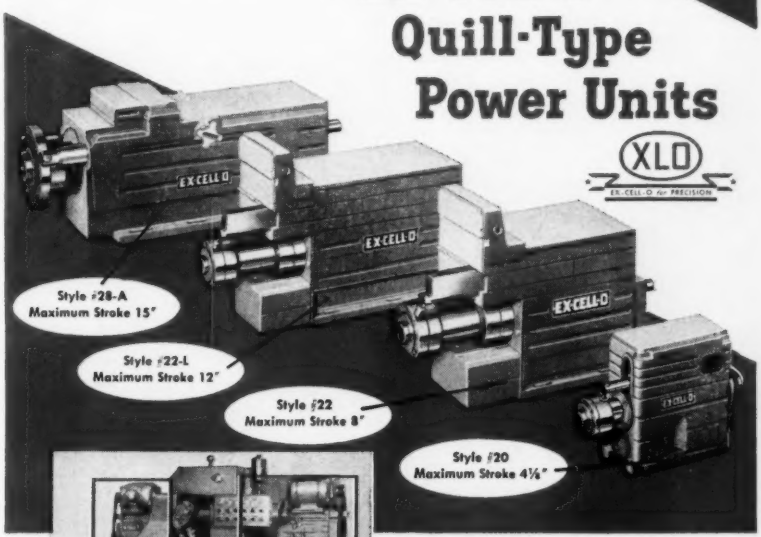
Most siver alloy brazing fillers flow very easily when molten, so that it is often unnecessary to go to the expense of duplicating the exact shape of the joint in the preform. Thus a square piece of filler metal can frequently be substituted for a disc of equal volume, and the waste encountered in stamping out the disc is eliminated. Whenever possible washers should be stamped from wire rings rather than punched from sheet stock.

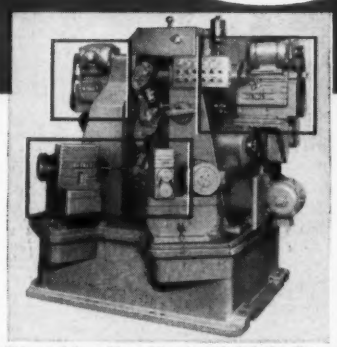
Before specifying an elaborately shaped preform, it is well to check whether several pieces of wire laid along the joint seam might do the same job. Because of the high ductility of most silver alloy filler metals, the wire, rod and thin strip usually can be formed into rings, hairpins, and other shapes simply by bending over a form of appropriate shape. Rings are commonly made by winding wire around a mandrel of proper diameter to form a coil. Then, cutting the coil longitudinally with a pair of side wire cutters produces the individual rings

Handy & Harman suggests a few simple precautions when using preforms to assure a strong dependable joint. When a shim or other preform is used for a butt joint, the members should be free to settle in place when the filler metal flows, with the application of slight pressure if necessary, and thus squeeze out any excess filler metal and flux. When brazing, make certain that the torch flame or other heat source does not play directly on the preplaced filler metal and melt it prematurely. In all cases the filler metal should be melted by heat transmitted by the parent metals. When heating parts of unequal cross section, more heat should be concentrated in the thicker member in order to bring it up to brazing temperature at the same rate as the thinner member. Otherwise the thinner member may overheat and buckle or distort befor the heavier piece reaches brazing temperature.

FOR AUTOMATIC CYCLES IN PRODUCTION MACHINES: **Ex-Cell-O Quill-Type Power Units**

XLO





This special machine with automatic indexing fixture core-drills piston pin holes and drills angular oil holes. It uses six Ex-Cell-O Power Units (shown without belt guards) operated from a central push-button station.

Ex-Cell-O Hydraulic Power Units feed and rotate cutting tools in easily controlled automatic cycles. They actuate single tools or multiple spindle heads for such operations as drilling, reaming, counterboring and spot-facing. Hydraulic operation provides smooth, powerful movements.

A machine utilizing Ex-Cell-O Power Units can be very simple, with manual loading and clamping. Or it can be designed with work handling equipment for automation . . .

For complete information, including specifications and installation drawings, ask your Ex-Cell-O Representative or write Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

85-14

CIRCLE INFORM-A-GRAM KEY NO. 1371

EXPANDING MANDREL SIMPLIFIES GEAR PRODUCTION

Today's high speed machine tools demand quiet running gears produced to the closest tolerances possible. Recognizing this fact, Sundstrand Machine Tool Co., Rockford, Ill., has already made gears for its own standard and special machines with great precision and accuracy. Recently, a method was discovered for simplifying the production of these gears.

Several steps in the production process have been changed over to utilize "Roll-Lock" precision expanding mandrels which are made by Scully-Jones and Co., Chicago, Ill. These mandrels combine precision with ease of operation. Using an internal-expanding roller taper design, they take advantage of the elastic properties of metal to expand the surface of the mandrel evenly to create an accurate, centering shrink fit in the bore of the gear blank. This fit is accurate within .0001" and is achieved by a simple twist of the actuating cone.

The mandrels are used on a Sundstrand lathe for the rough turning operation on the gear blanks. This assures an accurate relationship between the bore, the OD, and the sides of the gear. Maximum runout on the finished gear is about .0003", and little difficulty has been experienced in keeping gears within that tolerance.

Fig. 1. Initial step in gear production at Sundstrand Machine Tool Co., is turning this gear with surfaces accurate in relation to each other.

Fig. 2. Gear shaving (on the mandrel) corrects tooth profile to within .0003".

When hobbing has been completed, the gears go back on the "Roll-Lock" mandrels for the shaving operation. Once again ease of operation and accuracy of the mandrels becomes important. Mounting the gear on one of these mandrels for shaving is no longer a critical step. Very little skill is required for the operator to use the

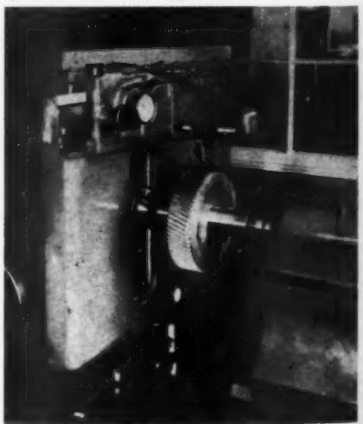


Fig. 3. In Sundstrand's inspection department, the gears are once again mounted on Roll-Lock mandrels to achieve the same accuracy found in production processes.

SPECIAL INTRODUCTORY UNIT

WHISTLER

10 HOLE MAGNETIC PERFORATING DIE

Cut die costs drastically, start production quicker. This M-12-14 Complete Introductory Unit includes a set of blank templates, ten punches, dies, strippers and punch and die retainers complete to make up a ten hole precision perforating die. Any diameters from ⅛" to ½" to your selection. Catalog illustrates additional re-use economies.

$675

NET F. O. B. OUR PLANT

WHISTLER DIES ARE CUTTING COSTS FROM COAST TO COAST

SEND FOR CATALOG Illustration shows how quick and simple it is to set up a Whistler Magnetic Perforating Die ready for production. Larger standard units can be added to suit your requirements.

S. B. WHISTLER & SONS, INC.

Manufacturers of Adjustable, Magnetic and Custom Built Dies for All Industry

748 Military Road Buffalo 23, New York

CIRCLE INFORM-A-GRAM KEY NO. 1381

mandrel. It is practically foolproof and will run true in the machine unless seriously damaged.

The accuracy built into the "Roll-Lock" mandrel is such that its use in the shaving process makes it possible to correct the tooth profile and held final tolerances within .0003". Pitch diameter runout is virtually eliminated.

After shaving and heat treatment, the OD of the gear is gripped while the bore is finish ground. Sides are then finish ground on a surface grinder and the gear blank is complete, with every surface square with every other surface.

The gears are then taken to the inspection department where another set of "Roll-Lock" mandrels is maintained solely for inspection purposes. Experience has indicated that the gears run just as true at the final inspection as they did at the first production step.

Swiss Paper Analyzes Casting Differences

"Trends and Problems of the European Investment Casting Industry," a paper by Walter Sulzer of Winterthur, Switzerland, presented a detailed analysis of the difference between the American and European investment casting industries at a recent meeting of the Investment Casting Institute.

The paper was part of an exchange of technical information in which a joint paper by Ted Operhall and Charles Schwartz of Misco Precision Casting Co., Whitehall, Mich., was presented at a recent European investment casting conference.

Europe's period of introduction and development in the investment casting field has passed, according to Mr. Sulzer. "Today there are 46 precision foundries in Europe, with the heaviest concentration in Great Britain, followed by Germany, France, and the Netherlands." Except for Great Britain, the industry has had to find markets because of the almost complete absence of a significant aircraft industry in the other countries, he noted.

The polystyrene pattern has found a rather extended application, according to Mr. Sulzer, because of its accuracy and somewhat lower production costs. "Adding to this trend is the fact that the necessary steel dies are so much cheaper to produce in Europe because of the lower wages for skilled diemakers."

Mr. Sulzer pointed out that the making of refractory molds does not vary significantly from the techniques used in the U. S., although there is an indication that the industry is trying to get away from the more expensive binders such as Ethyl-Silikate. There is also a strong trend to replace alcohol-based binders with cheaper water-soluble binders.

The majority of the manufacturers still use small tilting furnaces for melting, Mr. Sulzer stated, either with an indirect-arc or induction-type heating system. Some companies, however, prefer static pouring, whereby vacuum is applied to the bottom of the mold.

Typical parts described in the conclusion of Mr. Sulzer's paper included medium to large components for aircraft wings and fuselages in low alloy steel, parts for sewing machines, compressor blades, and turbine wheels.

IT'S EASY TO ASK!
The Inform-A-Gram Card Page 150.1 is For Your Convenience When Making Inquiries.

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.

SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY 1 WEEK FROM RECEIPT OF ORDER

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 1391

MEN YOU SHOULD KNOW

The new manager-Manufacturing Engineering Unit at the Laminated & Insulating Products Dept. of General Electric Co. is **Carl A. Drake.** Mr. Drake joined the company in 1940.

◆

Harlan L. Meredith has been named staff assistant at Airline Welding and Engineering. He will work on research welding and process tooling development projects.

The new president of Griffin Wheel Co., a subsidiary of American Steel Foundries, is **Goff Smith. Ralph D. Brizzolara** was elected a director of the company.

◆

Appointment of **Howard C. Jones** as director of manufacturing, Consolidated Vacuum Div'n, Consolidated Electrodynamics Corp., has been announced by **Frank M. Jenner,** general manager.

Willard F. Bierman will take over as manager of sales and engineering for Madison Industries, Inc. The announcement was made by **H. F. Wulf,** president. Mr. Bierman has been chief engineer of the company since 1947.

◆

Andrew K. Wilson was named to the newly created position of vice president of industrial relations for Kearney & Trecker Corp. The appointment of **Morris L. Hutchens** as chief engineer was also announced.

◆

Warren C. Olson has been elected executive vice president of Besly-Welles Corp. His position as secretary of the company will be filled by **E. Kenneth Welles, Jr.**

◆

John H. Harris will be vice president in charge of planning and **Wallace T. Gray,** general works manager, for Brush Electronics Co.

◆

Douglas McIlvaine has been appointed to fill the newly created post of director of research and development for Acro Mfg. Co. His duties will include the development of new product lines.

◆

James D. Glenn is the new vice president of sales and **Maurice J. Day,** vice president of research and development for Crucible Steel Co. of America. The announcement of the appointments was made by **William P. Snyder, Jr.,** chairman of the board. **William H. Rea** was elected a director of the company.

◆

Edgar W. Engle is the new technical director of Vascoloy-Ramet Corp. He'll direct expanded research, development, and application engineering activities in the cemented carbide and cast non-ferrous alloy fields.

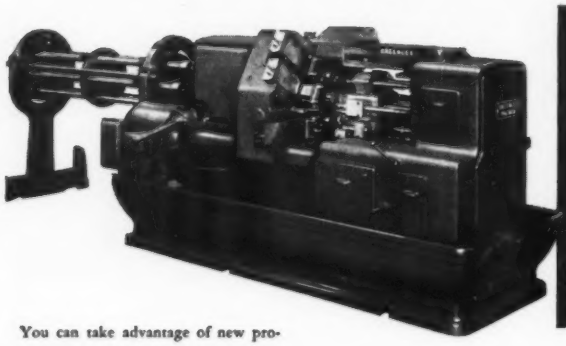
◆

Edward J. Lunney has been appointed chief engineer in charge of the Research and Analysis Dept. of Barry Controls Inc. He was previously with the Wright Air Development Center of the U. S. Air Force.

◆

Three officers have been elected to head Niagara Machine & Tool Works. They are **George E. Munschauer,** board chairman and chief executive officer; **Frederick E. Munschauer, Jr.,** president and general manager; and **Edwin A. Munschauer, Jr.,** treasurer and director. In addition, Frederick E. Munschauer, Jr., has announced that **Ransom B. De Lisle** has joined the company as purchasing agent.

now... greater accuracy, faster production



WITH GREENLEE SIX-SPINDLE AUTOMATICS

You can take advantage of new production techniques...attain higher levels of efficiency with the improved Greenlee 6-Spindle Bar Automatic. Its advanced design opens the door to some real profit opportunities. ● These design improvements are fully described in a catalog recently issued. Let us send you a copy today. Find out how Greenlee Automatics can save time and money in your plant. It will pay you to investigate.

IMPROVED SPINDLE CONSTRUCTION

The spindle has been completely redesigned to assure greater accuracy at higher speeds. True running... the new Greenlee spindle has five widely spaced, preloaded, angular-contact, precision ball bearings. Entire spindle is dynamically balanced for smooth operation. Metallic seals, labyrinth and friction washers with line contact provide maximum heat dissipation.

INCREASED SPEED

Spindle speed range has been increased. Enables you to take full advantage of the top efficiency and peak performance which carbide and high-speed tooling offer. Reduces downtime losses and tool costs.

WRITE FOR CATALOG No. A405

GREENLEE

GREENLEE BROS. & CO.
2041 Mason Avenue
Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1401

MEN YOU SHOULD KNOW

Walter E. Froehlich has been elect- vice president of Associated Spring Corp. He was placed in charge of all sales, research, and development activities of the company. **G. Theodore Zahnke** has been named general manager of the corporation's three Bristol divisions, succeeding Mr. Froehlich. **Arthur J. LeVasseur** has been promoted to purchasing agent for these three divisions. He succeeds Mr. Zahnke. **John M. Reilly** will take over as assistant purchasing agent.

◆

George F. Meyer has been named general superintendent of The Warner & Swasey Co., according to an announcement by **Walter K. Bailey**, president.

◆

John C. Terry, Jr. has joined Machine Products Corp. as chief engineer. He'll be responsible for developing inspection techniques for use with the "Rotab" universal checking table. Mr. Terry had been a gage engineering supervisor for Allison Engine Div'n, General Motors Corp.

◆

The new general manager of Willeys Carbide Tool Co. is **Donald N. McPherson.** He'll direct the production and co-ordination of the expanded Tungsten Carbide Metal Manufacturing and the Tool Manufacturing Div'ns.

◆

Richard F. Trimbach will take over as manager of new product development for Loewy Construction Co., div'n of Baldwin-Lima-Hamilton Corp. Prior to joining Loewy, he was executive assistant to the director of customer relations of Northrop Aircraft Co.

◆

Appointment of **George F. Hagger** as director of engineering for Snap-Tite, Inc., has been disclosed by **M. S. Clark,** president.

◆

M. R. McLary has been elected vice president of the Ingersoll Products Div'n of Borg-Warner Corp. He had been works manager of the division and will retain this title. **Fred S. Gombert** will take over as a vice president of the Ingersoll Conditioned Air Div'n.

◆

Russell W. Sloan will fill the newly created position of manager of commercial development of Pennsylvania Salt Mfg. Co. He'll be responsible for market analysis, market research, and market development on new products and on established products new to the company.

Daniel J. Girardi will head research and process control at The Timken Roller Bearing Co. As metallurgical engineer, he'll direct mill metallurgical work for all divisions of the company.

◆

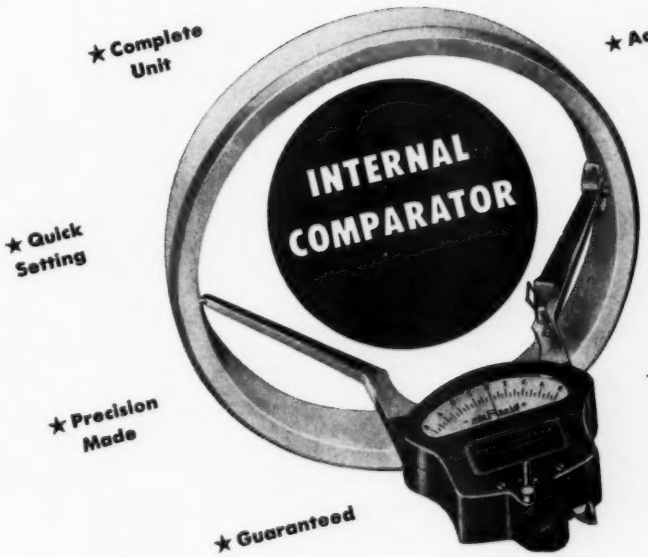
The Dumore Co. has made known the appointment of **George E. Shoup** as executive vice president. He joined the company in 1941 as a controller.

Earl M. Douglas has been named vice president of Dana Corp. in charge of technical activities relating to product engineering.

◆

The Taft-Peirce Mfg. Co. has named **Russell W. Grabinsky** assistant superintendent of the Small Tool and Gage Div'n. He had previously been active as production foreman in the Contract Service and the Small Tool and Gage Div'ns.

NEW "InteRapid"



New Internal Comparator Gage has gaging capacity from ⅜" diameter to 6" diameter. Meter-type scale, graduated in .0005", shows at a glance whether holes are oversize or undersize and by exactly how much.

Gage is designed for use on Jig Bores, Boring Machines, Internal Grinders, Lathes and for all Inspection Personnel.

For complete details . . . write for Comparator Specification sheet.

PDQ

PORTAGE Double-Quick TOOL CO.

1046 Sweitzer Avenue • Akron 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1411

SHOT PEENING IMPROVES MATERIAL FATIGUE STRENGTH

"We shot peen for the sake of safety — to improve the fatigue strength of the material at points of greatest stress. Strength could be increased by use of additional material, but in the aircraft industry extra weight is undesirable."

This statement by a senior product engineer at Hamilton Standard division of United Aircraft Corporation in Windsor Locks, Conn, indicates the importance placed on shot peening for extra quality and safety in the propellers manufactured by this division. He goes on to say, "All material failures start with a surface crack. Peening creates a residual compressive stress in the surface layer of the part and this improve fatigue strengths — that is, it prevents the starting of surface cracks. Through peening we have been able to put more strength and safety into our products without increasing their weight."

Hamilton Standard produces two completely different kinds of blades for its propellers — built-up steel and forged solid aluminum. The aluminum blade is subjected to three shot peening operations. One of these is the peening of the inboard half of the outside of the aluminum blade. Each aluminum blade also has a "cavity" or "taper bore" extending approximately one-fourth the distance of the blade, starting from the base or inboard end. This cavity is shot peened in two operations, both involving special machines designed by Hamilton engineers and using various Pangborn components — blast tank, hose, separators, and so forth. The sidewalls of the cavity are peened mechanically as the blade revolves in the special machine. The blast nozzle, especially designed for the purpose, blows the shot to strike the sidewalls at a 90° angle. The end of the cavity is hand-blasted by a special tube nozzle which blows abrasive at approximately a 90° angle to that surface. In shot peening it is most important to maintain the 90° angle of impact on the surface being worked.

Fig. 1. The internal cavity in the aluminum propeller blade is shot peened by means of special machines. The sidewalls of the cavity are peened mechanically as the blades revolves in a special machine. The blast nozzle (specially developed), permits the shot to strike the sidewalls at a 90° angle, an important factor in shot peening.

In addition to the blades, the various parts (barrels, spiders, support blocks, and other precision parts) of the hub assembly are important in the manufacture of propellers. The stress areas of these parts are shot peened. First, parts to be peened are left exposed while other areas are masked. The parts are then placed in a special Pangborn machine that features an adjustable Rotoblast unit capable of turning at a 45° angle for effective peening. This is necessary to maintain the 90° angle impact mentioned above. With the new machine, peening time was cut from 15 min to less than 2 min.

FOR GREATER · · ·
Model HD68 machine drills 1 1/2 inch diameter holes in railroad track components.
PRODUCTION • EFFICIENCY • SAVINGS
Use an individually designed "Hole-Hog" Machine Tool for such jobs as:
• Multi-Spindle Boring
• Single and Multi-Spindle Honing
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Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.
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CIRCLE INFORM-A-GRAM KEY NO. 1421

An interesting sidelight on this operation is the development of a new method of dipping parts in a liquid, rubber-like, quick-drying plastic solution and carving away the plastic from the areas to be peened. This process has saved Hamilton Standard over $3,000 a month.

Fig. 2. Tooth damage was frequent on these rotors used in pneumatic starters for jet engines until Hamilton Standard began to shot peen them. Now a great deal of extra strength has been imparted to the part along with a wide safety margin.

Another special machine has been installed to peen rotors used in pneumatic starters for jet engines. Revolving at 25,000 rpm, the rotor teeth formerly broke easily; but, now that the rotors are peened at the base of the teeth, the part is stronger and a wide safety margin exists, even at speeds considerably in excess of the maximum now used.

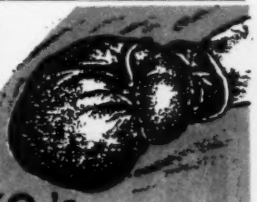
Other peening operations include the processing of gear segments, bolt heads, and miscellaneous parts. A modified air-blast cabinet is manually operated with a 20-sec blast time for peening of bolt heads. Another modified cabinet is used to operate automatically on a 3½-min cycle peening the lands and grooves of segment gears.

Fig. 3. Effective shot peening depends on the correct angle of impact as well as the use of good, round, uniform pellets of steel shot. If the shot is allowed to break up into grit, the purpose of shot peening would be defeated. Pangborn Corporation developed a special abrasive separator for Hamilton Standard which assures efficient screening of shot well within government standards.

Selection of the correct abrasive is extremely important in shot peening. Not only must an accurate angle of impact be observed, but it is essential that round, unbroken uniform pellets of steel shot be used. Allowing the shot to break up into grit and be used again would defeat the purpose of shot peening. Broken shot weakens rather than strengthens the surface of peened parts. Consequently, not only Hamilton Standard's own requirements but U. S. Government specifications require use of shot with less than ten broken grains per square inch of sample. Meeting this requirement is an absolute necessity of operation.

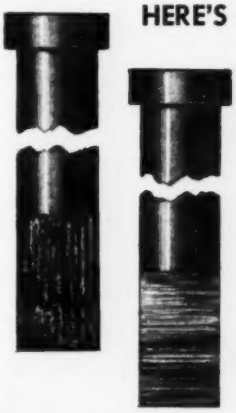
Until recently no abrasive separators were capable of screening used shot efficiently enough to meet the stated specifications. Consequently, Hamilton Standard's only solution was to use the shot once and discard it — costing the company $3,000 a week in abrasives. However, Pangborn engineers developed a new abrasive separator which operated so efficiently that abrasive can be screened well with-

DURABLE



The 1-2 PUNCH that KO.'s
PRESS DOWN-TIME
PRODUCTION DELAYS

HERE'S THE SECRET OF DURABLE'S SUCCESS:



1. VERTICAL LAPPING
. . . gives a "grinding grain" parallel to plane of action—reduces friction, heat, firing and galling.

2. ELECTROCOATING
. . . chrome carbide has 25% less friction than plain steel—further reduces friction, heat, firing and galling.

The DURABLE combination of VERTICAL LAPPING plus ELECTROCOATING knocks out your production delays with fewer shut-downs, less die maintenance, longer uninterrupted production. Vertical Lapping and chrome electrocoating make the Durable Patent Piercing Punch the perfect answer to YOUR PERFORATING PROBLEMS.

CUTS DOWN-TIME—
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GIVES MUCH LONGER PUNCH LIFE

Write today for full details on YOUR punching problems. You'll receive a fast, practical reply from the most DEPENDABLE punch maker in the world!

DURABLE NIB PUNCH gives improved punching on harder alloys.

DURABLE INTERMESH SLEEVES supports Punch so as to perforate metal many times thicker than hole diameter.

IF IT'S DURABLE IT'S DEPENDABLE

Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
1214 W. Madison Street, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1431

in government requirements, resulting in a savings of $50.00 per propeller.

The advantages of shot peening are summarized by an engineer of Hamilton Standard who says: "Today, airplanes must do more and weigh less (at less cost) than ever before. Shot peening plays an important role in making this possible."

JOIN THE MARCH OF DIMES JANUARY 3 TO 31

Die Cast Auto Engine Blocks Now a Reality

The successful development of aluminum die cast automobile engine blocks has been accomplished through the joint efforts of the Doehler-Jarvis division of National Lead Co. and Kaiser Aluminum & Chemical Co.

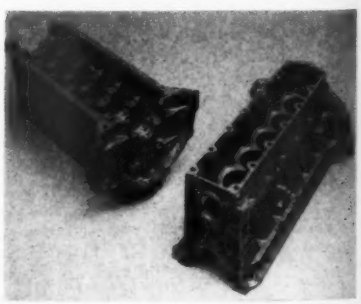
The straight type six-cylinder engine blocks, weighing approximately 50 lbs as they come from the die casting machine and 43 lbs when trimmed, represent the largest die castings ever made in aluminum. The same engine blocks in gray iron would weigh about 175 lbs.

The blocks are now produced experimentally at a Toledo plant of Doehler-Jarvis of the world's largest die casting machine. The machine handles dies weighing up to 50 tons, according to Frank J. Koegler, vice president of National Lead and general manager of Doehler-Jarvis.

Aluminum engine blocks should show a price advantage of approximately 10% over the conventional gray iron, Mr. Koegler points out. The die cast blocks need far less machining then the gray iron blocks because machining is confined to the main sealing areas.

This 72" die casting machine—the world's largest—produces six-cylinder aluminum automobile enblocks from an experimental die.

Heat conductivity of the aluminum is much higher than that of gray iron, so the aluminum blocks should require less complicated cooling systems. The smooth surfaces of the aluminum castings should prevent the occurence of uncontrollable sections and sand pockets restricting the flow of cooling water, a common problem found in gray iron engine blocks.



Aluminum die cast, six-cylinder automobile engine blocks weigh 43 lbs when trimmed, as compared with 175 lbs. for the same block in gray iron. All holes are cast in rather than drilled.

The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Saves: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO. "The Tool Holder People" 5220 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1441

The new blocks can be produced at a rate of 30 to 35 pcs/hr on a single machine, according to A. F. Bauer, chief engineer at Doehler-Jarvis, who has been in charge of the development. Not a single hole, he said, has to be drilled in the aluminum blocks. All 129 holes are cored and cast to size.

Development of V8 aluminum engine blocks which will weight between 70 and 75 lbs is underway.

Industrial TV Operated By Remote Control

Now closed-circuit TV installations, can be remotely controlled to provide operator safety in hazardous locations, assure undetected operation in security and surveillance work, and permits quick and accurate viewing of widely spaced objectives.

This was reported by Dage Television, Thompson Products, Inc., Michigan City, Ind., in announcing development of the unique television system.

Called the 285-A Servo System, it includes a multi-lens TV camera which is entirely directed by a separate monitor-console. By turning an appropriate knob on the console any function of the TV camera can be achieved.

Lenses on the camera are changed, focusing is set, and the camera is directed up or down, right or left by remote control. A built-in "memory" in the control also makes it possible to automatically point the camera in up to three different pre-set directions. The pre-set positions may be readily changed to meet varying observational tasks.

The camera may be mounted on a tripod, as shown, or fixed in a permanent location.

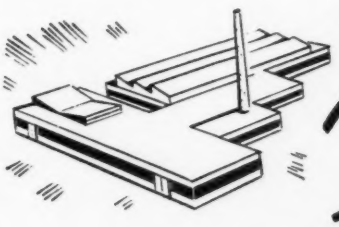
New Carbide Uses to be Covered at Carboloy Courses

Special sessions on milling cutter applications of cemented carbide and the application of carbide as wear-retarding components have been added to the customer training courses for this year at Carboloy.

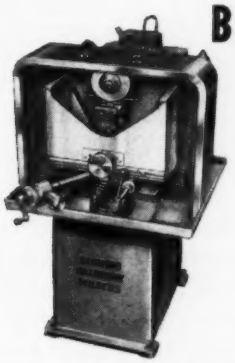
Regular training courses on cutting tools also will be given, as in the past. These will be altered, according to the company, to include discussions and demonstrations on throw-away type carbide inserts and instructions on the use of the new machinability computer.

The new milling sessions are to include instructions on carbide grade selection, brazing, grinding, discussion on milling speeds, table travel and machine horsepower, as well as step versus conventional mill demonstrations.

Sessions on carbides as wear-retarding components are to cover methods of attaching carbides, design considerations, and grinding procedures.



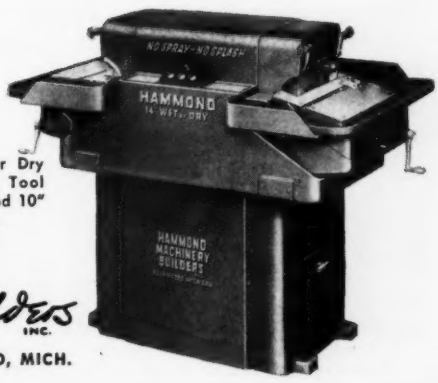
The Choice of
AMERICA'S LEADING MANUFACTURERS
Hammond
CARBIDE TOOL and CHIP BREAKER GRINDERS



SAVE TIME · TOOLS · WHEELS with America's "Choice" and most complete line of Carbide Tool, Chip Breaker and Diamond Finishing Grinders. Over 6,000 in service.

Clip this ad to your letterhead and Carbide Grinder Catalog will be sent by return mail.

CBW-6 Chip Breaker and Diamond Grinder. Other Models also available.



14-WD Wet or Dry 14" Carbide Tool Grinder. 6" and 10" also available.

Hammond Machinery Builders INC.
1631 DOUGLAS AVE., KALAMAZOO, MICH.

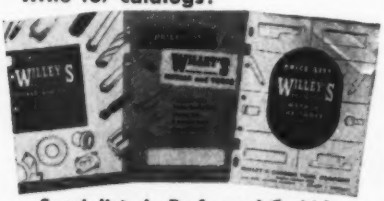
CIRCLE INFORM-A-GRAM KEY NO. 1451

FOR THE BUSINESS END OF THE Automatics

WILLEY'S TUNGSTEN CARBIDE TOOLS

For **PROFIT PRODUCTION** and **LONG, NON-STOP** runs... Willey's Tungsten Carbide Tools best meet the demands of Modern Automation.

Write for catalogs:



Specialists in Preformed Carbide Shapes and Tools to Blueprints

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Hwy. • Detroit 1, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1461

INDUSTRIAL MAGNIFIERS

24-page booklet tells how to select and use them

Copy will be sent you on request. Ask for "Industrial Magnifiers," Booklet I-67.

Here is what it tells you:

How a magnifier works
What to look for in selecting one
Why a good lens is important
What is meant by a "corrected" lens
Magnification vs. field of view
How to hold a magnifier

The booklet presents a selector chart on Industrial magnifiers from 2X to 20X, accompanied by a selector index. It also has catalog descriptions on dozens of Industrial magnifiers from pocket type to stand-mounted units.

BAUSCH & LOMB OPTICAL CO.

50401 Bausch Street **Rochester 2, N. Y.**

CIRCLE INFORM-A-GRAM KEY NO. 1462

THE PLYMOUTH "QUALIMATIC" V-8 ENGINE PLANT

A 64-page collection of 22 profusely illustrated technical articles, taken from the pages of the October, 1955 issue of TOOLING and PRODUCTION Magazine, which tells the behind-the-scenes story of this now-famous engine plant.

LIMITED SUPPLY IN STOCK.

Send For Your Copy Now. $1.50* each.

Use the attached coupon as your order blank.

"It is a rare honor for a publication in our field to be accorded the privilege of presenting in the words of a top manufacturing management team its play-by-play account of the conception, implementation and successful functioning of a $50,000,000 manufacturing enterprise."

The Editors

Tooling & Production

HUEBNER PUBLICATIONS, INC., 1975 Lee Road, Cleveland 18, O.

Gentlemen: Please send me at once_____copies of the reprint THE PLYMOUTH "QUALIMATIC" V-8 ENGINE PLANT @ $1.50* each, postpaid.

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Open account shipments on purchase orders of rated companies. Otherwise, check must accompany order. No C. O. D.'s, please. *Ohio customers add 3% sales tax.

Two new appointments to the field sales and engineering staffs of the Cutting Tool and Gage Div'ns of Pratt & Whitney Co., Inc. have been announced. **Joseph H. Rinehart, Jr.** has been named a sales engineer for both divisions with headquarters in Springfield, O. **Charles G. McPartland** will take over as a cutting tool engineer serving the West Coast area with headquarters in Los Angeles.

◆

Walter J. Walsh has been appointed Ohio sales representative for American Agile Corp., according to **Carl F. Freedman,** executive vice president and general manager.

◆

The new sales manager of the "POP" Rivet Div'n of United Shoe Machinery Corp., is **Charles E. Heilig, Jr.** He succeeds **S. R. Gookin** who has been assigned to other management duties.

◆

Harold Holsten will be a field engineer for the Abrasive Div'n of Elgin National Watch Co. Operating out of Monrovia, Calif., he'll serve West Coast manufacturers in the metal trades.

◆

The Aro Equipment Corp. has announced the appointment of **Don Gibbons** as division manager of Chicago and northern Illinois. With headquarters in Chicago, he'll be assisted by **John Conrad.**

◆

Richard E. Wells has been appointed West Coast service engineer for Winter Bros. Co., a division of National Twist Drill & Tool Co.

◆

Don P. Carr will be the new assistant to the manager of the Tool Steel Sales Div'n of Crucible Steel Co. of America. He'll be responsible for tool steel sales in Crucible's West Coast sales div'n with offices in Los Angeles.

◆

George E. Smith has been named manager of the Mid-Atlantic district of the Metalworking Div'n, Kennametal Inc. His headquarters will be in Philadelphia.

◆

Diamond Machine Tool Co. has announced the appointment of four new regional sales managers. They are **Royal Colby, E. W. Zeh, Porter Laird,** and **Charles Lawrence.**

Appointment of **William A. Gent** as field engineer for the Cleveland sales office of The Warner & Swasey Co. has been announced.

◆

Three appointments have been made by E. W. Bliss Co. **Fred G. Howell** will take over as sales engineer for the company's subsidiary, The Die Supply Co., in Detroit. **Robert Dilling** will be a sales engineer with the Bliss Die Supply Div'n in Burbank, Calif., and **Tom A. York,** with the Press Div'n in Rochester, N. Y.

Titanium Metals Corp. of America has established a Cleveland district sales office with **James C. Coffman** as manager of sales. **Donald B. Dik** has been selected to serve as manager of sales for the Eastern sales district, out of headquarters in New York.

◆

Samuel H. Greenwood has been promoted to the position of field sales manager for F. J. Stokes Machine Co. **Fred Hillsley** will succeed him as district manager of the Philadelphia territory.

BIG—FAST AND ECONOMICAL

HERE'S the finest metal cutting band saw available anywhere today . . . and, at the lowest price. The big, rugged Johnson Model J easily and accurately handles 10" rounds, 18" flats—affords a quick, simple set up plus entirely automatic operation. Beautifully designed and engineered, yet a brute for work, the versatile Model J is immediately available in the standard wet or dry models to suit your needs.

The big, dependable Model J will cut *anything* in your stock pile—faster and more accurately. See for yourself, how much time, labor and production dollars you can save with a Johnson saw.

SPECIFICATIONS

Capacity—10" rounds, 18" flats
Motor—½ H. P. Ball Bearing any voltage available, single or polyphase (¾ H. P. on wet machine)
Wheel Diameters—16"
Floor Space—66" x 31"
Bed—11" wide, 44" long, 6" deep, 24" high
Overall Height (Closed)—39"
Blade Length—11' 5" x ¾" x 032" All Standard blades of these specifications can be used.
Weight—Approximately 750 lbs. Crated 800 lbs. Boxed for export 875 lbs.
Speeds—35, 90, 130, 190 feet per minute
Casters—Optional at slight extra cost

OTHER MODELS AVAILABLE

Other nationally popular members of the Johnson line of metal cutting Band Saws include the 5" x 10" capacity Model "B" (wet or dry), the unique versatile mobile Model "M" and the Johnson Adjustable Stock Stand.

Johnson
MANUFACTURING CORPORATION
MAIN PLANT: BARNES & TAYLOR STS. • ALBION, MICHIGAN

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W. Q. Lundmark
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Des Plaines, Illinois

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Hastings Distributors
1605 Solano Avenue
Berkeley, California

CIRCLE INFORM-A-GRAM KEY NO. 1471

GROWING PAINS

A 50-percent expansion of its new Construction Machinery Division plant in Benton Harbor, Mich., has been announced by **Clark Equipment Company.**

A new plant of **Dayton Rubber Company** is now in production in Atlanta, Ga. It will supply Southern industry with industrial tapes, and natural and synthetic rubber rollers.

◆

The Los Angeles plant area of **Kenco Manufacturing Company** is being doubled. The expansion includes increased production facilities and the development of automatic and semi-automatic mass production processes, the first to be set up in the manufacture of small punch presses.

To meet an increasing demand from the country's railroad industry, **The Timken Roller Bearing Company** is installing a new railroad bearing production unit at the Columbus plant. Included in this producing unit will be screw machines, heat-treating equipment, roller headers, and inspection and shipping departments. The installation which has an annual capacity of 160,000 bearings, will cost $5,000,000.

◆

The Oster Manufacturing Company has moved into a new plant in Wickliffe, O. The company produces pipe and bolt threading machinery and material handling equipment.

◆

The Detroit sales office of **Illinois Tool Works,** manufacturer of machine and cutting tools, and its Shakeproof Division, producer of fastening devices, have moved into new quarters.

◆

Two Cleveland firms, **Central Petroleum Company** and **Lewis Machine Company,** have been purchased by **Curtis Manufacturing Company.** Lewis Machine makes wire straightening and cutting machinery.

◆

A new automatic transmission plant is being constructed by **Ford Motor Company** in Sharonville, O. This new factory, a part of the Ford $3,750,000,000 expansion program, will not affect current company production at Automatic Transmission Division's other facility in Cincinnati or its headquarters plant at Lavonia, Mich. Ford is also building a 1,200,000-sq.-ft. steering gear and cold heading plant in Columbus, O. This facility will be operated by the Dearborn General Manufacturing Division.

◆

Further expansion of **Snyder Tool & Engineering Company,** Detroit manufacturer of automated special machine tools, has been announced. The company has purchased an 18,000-sq.-ft. building to provide adequate warehouse facilities to speed the building of automated machines. A $500,000 addition to the main plant is also being completed.

◆

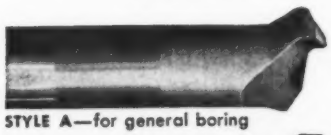
The Atrax Company is adding both space and equipment to their Newington, Conn., plant. The company manufactures solid tungsten carbide tools.

◆

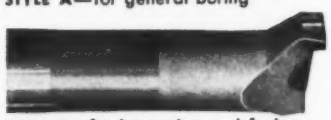
The Landis Machine Company is constructing an addition to the present Tap Division building. This 11,250-sq.-ft. section will house the research department and the newly created thread roll die department.

Check List for Handy Literature on

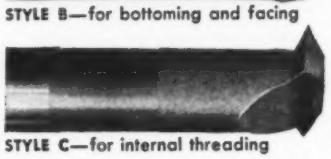
BOKUM BORING TOOLS



STYLE A—for general boring



STYLE B—for bottoming and facing



STYLE C—for internal threading

To help you select the right tool for the job you have, Bokum has prepared a complete list of catalogs and template drawings covering Bokum products. Here is a handy check list—write for the copy, or copies you need:

— Boring and threading tools—super high-speed steel	Cat. 1139-6
— Jig boring sets of high-speed steel tools	Supplement No. 1 to Cat. 1139-6
— Carbide-tipped boring and threading tools	Cat. 398-6
— Jig boring sets of carbide-tipped tools	Supplement No. 1 to Cat. 398-6
— Solid Tungsten carbide boring tools	Cat. 948
— Short Neck boring tools 500 Series, High-speed steel	Cat. HSS. 500
— Short Neck boring tools 500 Series, Carbide-tipped	Cat. CT. 500
— Lathe holders for boring and threading tools	Cat. 483
— Price sheet for holders shown in	Cat. 483
— Holders for turret lathes and screw machines	Supplement No. 1 to Cat. 483
— Thread Recessing tools Style T-R	Cat. T-R
— Thread Recessing tools Style B-CH	Cat. B-CH
— Back Chamfering Tools	Cat. O-R
— O-Ring Grooving Tools	Cat. RR
— Retaining Ring Grooving Tools (internal)	Cat. AB-1
— Resharpening fixture for small tools—Nos. 00000 to 3, Style A & B	Cat. AB-4-12
— Resharpening fixture for tools Nos. 4 to 12, Style A & B	Cat. ABC Universal
— Universal Resharpening Fixture for tools Nos. 00000 to 9, Style A, B and C	Cat. Manual 949
— Resharpening Manual for all Bokum Tools	Cat. Rapidor 454
— Rapidor External Turning and Threading tools	

Bokum tools are available in high speed steel, carbide-tipped and solid tungsten carbide. Applications: boring, recessing, chamfering, undercutting, serrating, burring, boring and facing, centering, end radius forming, form relieving, boring and chamfering and many others. 4900

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BOKUM TOOL CO. 14775 Wildemere Ave., Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1481

A SMALL LOT
METAL STAMPING SERVICE
AT LOWEST POSSIBLE DIE COST

BAR STOCK TO STAMPING

The cost was cut from $1.01 to $0.11 each on this flange by redesign to a stamping instead of machining from bar stock.

The performance of the die-stamped part was equivalent.

On 1100 pieces per year, the saving was $990.00, or — 89%

* * *

This briefly describes the cost of a typical part made for one of our thousands of customers.

We have a short run stamping service to offer, which is beyond comparison.

Factory trained representatives in all centers. • Write for full details.

DAYTON ROGERS
Manufacturing Company

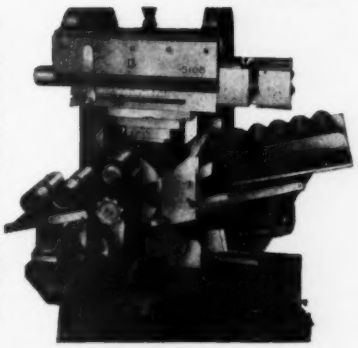
MINNEAPOLIS 7B, MINNESOTA
CIRCLE INFORM-A-GRAM KEY NO. 1491

Faster, Better, Less Expensive . . .
MARKING
with job designed
GEO. T. SCHMIDT
Production Marking Machines

The fully automatic, hydraulically - operated tube marker shown here was designed by GTS engineers for major automotive manufacturers.

The units roll a trademark and part number on 2500 to 3000 mild steel thin-walled tubes per hour — a speed that cuts cost per impression to the bone. Hydraulic control keeps all impressions clean, accurate, and of precisely the same depth.

Have a GTS Sales Engineer call on you, without obligation, to discuss how modern marking methods can save costs and speed production in your operation.



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WILDER PROJECTOR
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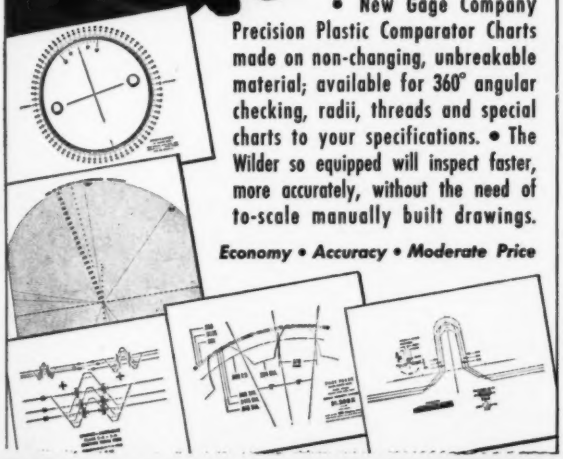

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ROTARY TABLE

*Proved by actual on-the-job performance

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

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937 West Lake Street, Dept. A, Chicago 7, Illinois
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JIG and FIXTURE COMPONENTS

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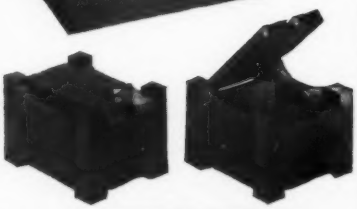
Fixtures in a Jiffy!

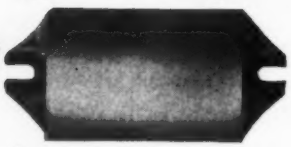
Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized and precision machine castings. Full scale sheets of 7 standard sizes will be included with your catalog if requested.

BOX JIGS



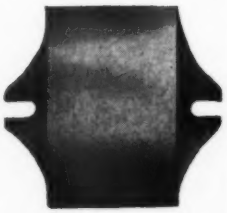
Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

MILL FIXTURE BASES



The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.

Sure Lock Fixture Keys See Page 41 of our Template Catalog



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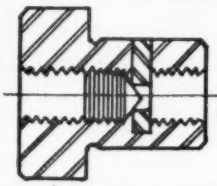
in our Line of 500 Components



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FLAT NOSE HEEL CLAMPS

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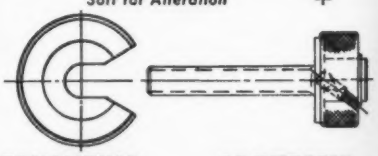

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4	28	50	871	1221	1411	1541	1673	1733	1791	1842	1885
5	29	51	881	1231	1421	1551	1674	1741	1792	1843	1891
7	30	53	891	1241	1431	1561	1675	1742	1793	1851	1892
8	31	54	1011	1251	1441	1571	1681	1743	1794	1852	1893
9	32	55	1021	1261	1451	1601	1691	1744	1795	1853	1894
10	33	56	1031	1271	1461	1602	1692	1751	1801	1854	1895
11	34	57	1041	1281	1462	1603	1693	1752	1802	1861	1896
12	35	58	1051	1291	1471	1611	1701	1753	1803	1862	1897
13	37	59	1061	1301	1481	1641	1702	1754	1811	1863	1911
15	38	60	1071	1311	1491	1651	1711	1761	1812	1864	1921
16	39	62	1091	1321	1492	1652	1712	1762	1813	1865	
17	41	63	1111	1331	1493	1653	1713	1783	1814	1871	
18	42	871	1121	1341	1494	1654	1714	1784	1821	1872	
19	43	891	1131	1351	1501	1656	1721	1788	1822	1873	
21	44	901	1141	1361	1502	1656	1722	1771	1831	1874	
23	45	911	1151	1371	1503	1661	1723	1772	1832	1881	

EDITORIAL ITEMS

A1	A20	A39	B10	B29	B48	B67	B86	C9	E10
A2	A21	A40	B11	B30	B49	B68	B87	C10	E11
A3	A22	A41	B12	B31	B50	B69	B88	C11	
A4	A23	A42	B13	B32	B51	B70	B89	C12	
A5	A24	A43	B14	B33	B52	B71	B90	C13	
A6	A25	A44	B15	B34	B53	B72	B91	C14	
A7	A26	A45	B16	B35	B54	B73	B92	C15	
A8	A27	A46	B17	B36	B55	B74	B93	C16	
A9	A28	A47	B18	B37	B56	B75	B94	C17	
A10	A29	A48	B19	B38	B57	B76	B95	C18	
A11	A30	B1	B20	B39	B58	B77	B96	E1	
A12	A31	B2	B21	B40	B59	B78	C1	E2	
A13	A32	B3	B22	B41	B60	B79	C2	E3	
A14	A33	B4	B23	B42	B61	B80	C3	E4	
A15	A34	B5	B24	B43	B62	B81	C4	E5	
A16	A35	B6	B25	B44	B63	B82	C5	E6	
A17	A36	B7	B26	B45	B64	B83	C6	E7	
A18	A37	B8	B27	B46	B65	B84	C7	E8	
A19	A38	B9	B28	B47	B66	B85	C8	E9	

Which article in this issue was of most interest to you? _____

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THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A6	A25	A44	B15	B34	B53	B72	B91	C14	
A7	A26	A45	B16	B35	B54	B73	B92	C15	
A8	A27	A46	B17	B36	B55	B74	B93	C16	
A9	A28	A47	B18	B37	B56	B75	B94	C17	
A10	A29	A48	B19	B38	B57	B76	B95	C18	
A11	A30	B1	B20	B39	B58	B77	B96	E1	
A12	A31	B2	B21	B40	B59	B78	C1	E2	
A13	A32	B3	B22	B41	B60	B79	C2	E3	
A14	A33	B4	B23	B42	B61	B80	C3	E4	
A15	A34	B5	B24	B43	B62	B81	C4	E5	
A16	A35	B6	B25	B44	B63	B82	C5	E6	
A17	A36	B7	B26	B45	B64	B83	C6	E7	
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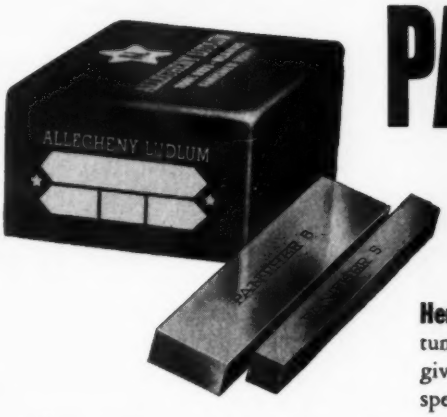

Here's what you GET in Panther 5 . . . A high-carbon, high-vanadium, tungsten-bearing high speed steel with 5% cobalt. Its analysis is designed to give this grade the highest red-hardness and abrasion-resistance of *any* high speed steel.

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CIRCLE INFORM-A-GRAM KEY NO. 1511

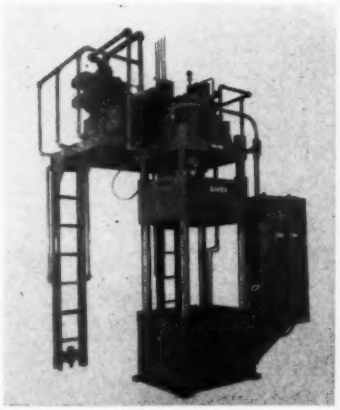
• *New Equipment*
• *New Materials*
• *New Literature*

WHAT'S NEW

Replace 3 to 4 Conventional Single-Stage Grinders with the new IMS M-400 granulator. It is a 2-stage, 11" x 17" throat high out-put granulator. It quadruples grinder output, grinding big parts faster without heating up the plastic. A bulletin on the M-400 is supplied by Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, or—**Circle E1.**

Epocast H-991-A "Wipe-On" Paste has been developed for sealing low pressure laminated polyester structures. Mixed with a hardener and wiped on the surface of the structure, the paste will readily fill small pin holes to give a smooth uniform surface. Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, manufactures Epocast H-991-A. **Circle E2.**

A New 100-Ton Automatic Press combines highest closing speed with maximum flexibility and ease of maintenance. The closure speed ranges from 9.6 to 400"/min. The press is able to handle phenolics, ureas, alkyd, teflon, melamines, glaskyd, gunk, and all thermosetting materials. Model 100-2430-10 is a



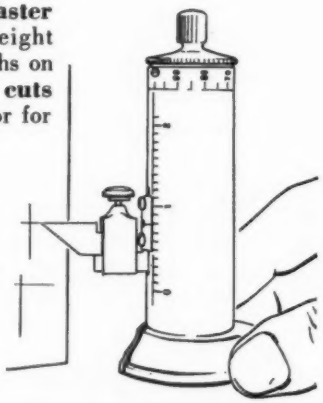
hydraulically operated press with a special safety control which prevents mold damage in case of ejection failure. Baker Brothers, Inc., P. O. Box 101, Station F, Toledo 10, O., or — **Circle Inform-A-Gram No. E3.**

The Revised "1956 Condensed Reference File of Bakelite Plastics and Resins" presents the latest information about the properties and uses of these materials. More than 50 plastics and resins are described. Information is given about the ability of Bakelite plastics and resins to be formed or processed in manufacturing operations. Also, typical products and uses of these materials are shown in 65 photos, and discussed. Copies of the reference file are supplied by Bakelite Co., Div'n of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, or —**Circle Inform-A-Gram No. E4.**

A New Series of Standard Mold Bases has been produced. The 10⅞" wide bases come in 10 mold plate thicknesses from ⅞" to 5⅛", insuring 100-cavity retainer set combinations. These are available in each of four lengths, 12", 14", 18", and 23½", for a total of 400 mold base combinations. Features include clamp slots to save platen space, stop pins welded to the ejector bar to prevent loosening and ejection interference and rigid construction with less parts. Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, or — **Circle No. E5.**

with GREIST MICRO-HEIGHT® GAGE

Precision-built Micro-Height reads **faster than your micrometer!** It measures height direct from **zero at base** to 3". Hundredths on barrel...thousandths on large head that **cuts reading time!** Attach your dial indicator for quick measuring between holes, surfaces!



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Micro-Height also scribes like your vernier height gauge. Riser extends range to 9".

Precision-built, satin-chrome finished Micro-Height Gage quickly pays for itself! ***Write for circular with prices.***

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Precision Products since 1871

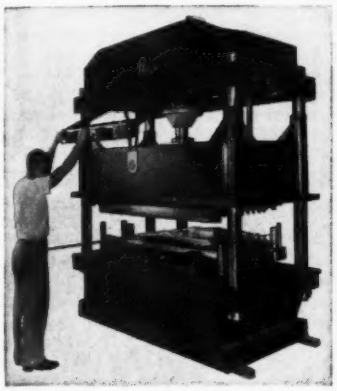
CIRCLE INFORM-A-GRAM KEY NO. 1521

IN PLASTICS?

• *Plastics Fabrication*
• *Plastic Tooling*
• *Plastics Molding*

The 1956 IMS Grinder Catalog has been issued by Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20. These molded part grinders are designed for single purpose-maximum efficiency to save labor costs. They feature simplicity in construction, maximum throat size, maximum capacity/hp, minimum floor space/lb of capacity. Each model is illustrated and described complete with specifications and applications. **Circle Inform-A-Gram No. E6.**

Hydraulic Presses for trimming and piercing parts made from vacuum formed plastic have been announced by Dake Corp., Grand Haven, Mich. The design of this line of presses permits operating speeds to match those of the forming equip-



ment. The features include fast ram approach and adjustable stroke control. Details on the five standard models that are available in capacities from 75 to 300 tons, are found in Bulletin 352, or — **Circle No. E7.**

An Edge Planer has been designed specifically for edging and finishing hard plastics. It is used in a high speed drill press or routing head to edge hard plastics in one pass without coolants. The edge of the work is pushed across the perimeter of the planer which smooths the edge or cuts the desired angle or radius. Square, radius, or angular edges are formed without changing tools or stations. Dia-Chrome Co., 722 S. Verdugo Rd., Glendale 5, Calif., or — **Circle Inform-A-Gram No. E8.**

Filled Epoxy Resins containing aluminum powder fulfill mechanical requirements in casting, bonding, and coating. A Furane bulletin contains a table which lists and explains the physical differences between Epocast 4-C and 4-D. Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, will supply copies of Bulletin EP-55-61, or — **Circle No. E9.**

A New Adhesive for polyurethane foam, "Polyseam" has been developed. It is designed to allow ample fabricating time after cementing. The odorless adhesive which may be used as it is, has a workable tack time of from 3 to 10 min. after cementing and loses depression tack within 24 hrs. Anchor Adhesives Corp., 36-23 — 164th St., Flushing, N. Y., or — **Inform-A-Gram No. E10.**

Simultaneous "Two-Way" Vacuum and Drape Forming with male and female molds is performed by the VacForm Model 88-FM. This new machine is an adaptation of the VacForm Model 88. It uses molds of plastic, metal, etc. to shape many types of thermoplastic films and sheets. Vacuum Forming Corp., Port Washington, N. Y., or — **Circle E11.**

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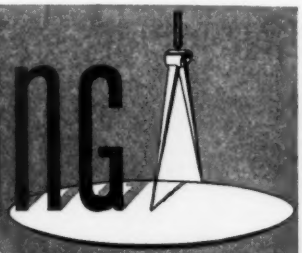
STANDARDIZE *with* RING



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CIRCLE INFORM-A-GRAM KEY NO. 1531

SAFE PRACTICES IN WELDING

by W. Schweisheimer, M.D.
Rye, New York

HEALTH HAZARDS in welding operations are relatively few. If proper safety rules are applied and protective equipment is used, even these hazards can be guarded against. Eyes, lungs, throat, and stomach are the principal areas affected in welding operations.

Electric welding arcs give off infrared radiation, visible light of high intensity, ultraviolet radiation, heat, and fumes from metals and fluxes. Looking at the arc only a few seconds can cause a painful "eye flash" which does not appear immediately. In such cases relief may be had by protecting the eye from light and covering them with a cloth frequently wrung out in cold water. Eye drops at the beginning of treatment may reduce discomfort.

Blindness among Welders

Blindness among welders is probably no more frequent than among workers in kindred mechanical trades, the Journal of the American Medical Association recently pointed out. Mechanical injury is the chief cause of total blindness. Lesser eye injuries, however, are far more frequent.

Ultraviolet radiation leads to flash injuries with painful damage to the eye, but less than 1% of the ultraviolet rays penetrate to the interior of the eye.

On the other hand, infrared rays constituting some 69% of the total radiation of arc flash do enter the eye interior to the extent of about 12%. The usual protection against the more active ultraviolet rays does not always exclude the infrared rays. Occasionally, though rarely, cataracts develop. A cataract is an eye disorder in which the pupil, usually black and transparent, becomes colored and opaque. This type cataract also occurs among glass workers.

Welding is an ever-more important metalworking process. Industrial management should be aware of the dangers to which welders may be exposed, and against which proper safeguards should be taken.

Welders' Flash

A survey of 47 cases of flash burn of the eyes was made by L. K. Woodward. Goggles and hoods give adequate protection against this accident. Chief complaint in eye flash from arc welding is pain in one or both eyes, accompanied by the feeling of having a foreign body in the eye such as sand. With proper care these discomforts disappear, usually within 24 to 48 hrs.

Eyes can be protected from infrared rays by ferric oxide lenses which filter out most of the harmful radiations. In some cases, a higher level of plant illumination will offset the disadvantage of dark glasses.

It is not the welder, however, who is the most frequent victim of his own arc, but the person working near him. The welder protects himself with a hood. He may receive a flash injury from another welder's arc or from his own arc accidentally struck while his hood is raised. Minimal safe distance to a welder's arc without goggle protection is 200'.

Protection Required

The methods and protective devices for controlling exposure to harmful rays produced in welding operations are well known and very effective. However, a short survey of the protection required for different welding operations, as outlined by A. D. Brandt and H. E. Seifert in the "Manual of Industrial Hygiene", may be of interest:

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Operation	Protection
Production welding at a permanent location	Permanent shield with proper-density light filter; helmet or hand shield with proper-density light filter; or goggles with proper-density lens
Working in the vicinity of a welding operation	Goggles or spectacles with No. 3 or No. 4 shade lens
Light gas cutting and welding, arc welding up to 30 amps	Goggles or spectacles with No. 5 shade lens
Heavy gas welding, arc cutting, and welding between 30 and 75 amps	Helmet, shield, or in some cases goggles with No. 8 shade filter glass
Arc welding and cutting between 75 and 200 amps	Helmet or shield with No. 10 shade filter glass
Arc welding and cutting between 200 and 400 amps	Helmet or shield with No. 12 shade filter glass
Arc welding and cutting above 400 amps	Helmet or shield with No. 14 shade filter glass

These aids are in addition to protective clothing for the welder, designed to prevent any skin exposure whatsoever. Welding areas in a plant should be enclosed so as to protect nearby workers. Enclosures should be well ventilated. If enclosure is temporary in nature, and there is any doubt as to the adequacy of ventilation, respirators should be employed.

Smoke Composition

According to a study by T. R. Jones and J. A. Lockhart, welding produces smoke composed of ozone, nitrogen oxides, asbestos, and small particles of iron less than 0.5 microns in diameter. The composition of the smoke varies with the type of metal being welded. Ordinarily the welding rods are composed of approximately the same alloy as that being welded.

Welding fumes may produce acute and chronic changes in the lungs. Particular precautions should be taken when work materials, electrodes or fluxes containing zinc, lead, manganese, cadmium or other poisonous metals are used.

Ventilation must be adequate to remove the fumes given off during welding. Fumes are a special problem when welding is performed in a small confined space. Generally, mechanical ventilation should be provided so that a current of fresh air is drawn across the worker towards the work. Air masks and exhaust hoods give protection against the fumes but are not used extensively. While many welders do not like to use respiratory masks, these masks do give effective protection when welding in a confined and poorly ventilated space, in boilers, and in tanks.

In Czechoslovakia, Dr. B. Soucek recently studied the nitrogen oxides in the atmosphere of welders' workplaces. The lowest concentrations of nitrous gases were found in the air in the middle of workrooms under normal conditions. When the workroom was closed, in winter, average concentrations rose five-fold. Cheapest way to lower the concentration of nitrous oxide in working places was natural draft, best directed horizontally. Vertical drafts may carry considerable amounts of nitrous oxide to crane drivers. Draft intensity should be low enough to avoid physical discomfort. Mechanical exhaust systems lower nitrous oxide concentrations substantially.

Welding Not Hazardous

The danger of metal fumes is also pointed out by Dr. John Brodie in California and Western Medicine. There is, also, a lack of oxygen if the welding is done in a confined space.

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In cutting galvanized pipes or welding galvanized sheets with the electric or acetylene torch, some operators will develop metal fume fever. This is because the galvanized coating contains over 95% zinc. A typical attack of metal fume fever begins after the man has left his work . . . several hours after exposure to the fumes. After going to sleep, he awakens with a chill, feels feverish, and breaks out in perspiration. His temperature may be between 100° and 102°F. Such an attack lasts 24 to 48 hrs. These workers often gradually develop a certain degree of resistance. Out of 100 workers exposed to galvanized fumes, about 75 do not suffer at all, according to Dr. Brodie, while about 20 have chills occasionally and only 5 have frequent attacks.

Nitrous gases are responsible for a local reaction in the lungs. After exposure the worker has an acid taste in his mouth and begins to cough. In the fresh air his condition may improve quickly. But 5 or 6 hrs later the cough returns in a more intensive form with shortness of breath. It may develop into a serious condition.

Welding, Dr. Brodie points out, is not a hazardous occupation provided the concentration of fumes is kept at a low level. Although after many years of welding the lungs may show certain fibrotic or nodular changes, which in an X-ray film may remind one of early silicosis, there is neither the shortness of breath nor the tendency to tuberculosis which is seen in silicosis.

Other authorities have reported that removal of the worker from exposure to metal fumes will usually result, in a matter of months, in disappearance of respiratory symptoms and a gradual elimination of changes revealed by X-ray.

Caution must be taken when using general supply ventilation alone where welding operations are in progress. Dr. Yale Rosenfeld, in Industrial Medicine, found that installation of local exhaust equipment increased the welder's efficiency while removing contaminating dusts, fumes, and gases at their point of origin. Respirators are useful but are not essential for constant daylong use at most jobs.

Stomach Troubles

Stomach and other digestive disturbances are frequent among welders, particularly in comparison with other industrial occupations. The changing weekly shift is an important influence in the prevalence of stomach troubles. Any welder whose working hours make it hard to avoid certain irregularities in living conditions, especially with changing eating habits, should take special care of his digestive organs.

In Germany, Drs. F. Sommer and K. Reinhardt of the X-ray Department, University Homburg/Saar, recently published a study on the complaints of electrowelders who believed their stomach troubles were caused by their occupational activity. Ulcers of the stomach or the duodenum, first part of the intestines, were found in 10% of the X-ray controlled cases. A catarrh of the stomach, gastritis, was found in 39% of the cases.

It seems that electrowelders generally have comparatively more ulcers of the digestive organs (peptic ulcers) than persons in other occupations. Both manganese and arsenic, with which electrowelders come in contact, have been held responsible for such ailments.

The advice, "Drink plenty of milk!", has been given to welders of all types by expert physicians, both as a preventative measure against stomach troubles and for treatment of existing complaints. However, the Journal of the American Medical Association reports that milk consumption, while commendable, should not be relied on as constituting adequate protection against the toxicity of welding fumes.

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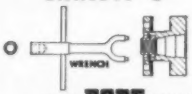

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The ultrasonic barrier to full scale manufacturing operations including soldering, grinding, plating, cleaning and degreasing, has been broken by the introduction of low cost, high frequency, rotating generators ranging in size from 2 to 150 kilowatts.

These alternators developed by Acoustica Associates, Inc. Glenwood Landing, L. I., N. Y., are capable of supplying economical power for energizing multiple arrays of above-audible sound generating transducers needed to agitate materials and products being processed en masse, as in degassing molten metals; plating, cleaning and degreasing; or for energizing groups of dip or tool soldering stations as well as drilling, cutting and grinding machines. As a consequence, the favorable results of laboratory ultrasonic experimentation can now be extended into full-scale plant production.

Ultrasonic processing invariably requires a considerable amount of high frequency power per unit of treated work. As such power had previously been generated by very expensive and complicated electronic supplies, economic considerations prevented commercially feasible employment of ultrasonic techniques except on a few basic machine types. Production systems can now be supplied that consist of banks of magnetostrictive or ceramic-type piezoelectric transducers, which may be submersed or externally mounted in existing equipment and which are driven by an appropriately rated, high frequency, motor driven alternator.

For example, Acoustica's 230-volt, 20,000-cps single phase, 5-KW generator driven by a 15-hp, 3-phase, 60-cycle, 220-440 volt AC squirrel cage induction motor, will energize up to 10 submersed 400-watt transducers of any type strategically located in a typical cleaning and degreasing system. Each transducer will cause copius cavitation through a large field in the solution. The explosive forces caused by the collapse and formation of millions of entrapped vapor bubbles at the rate of 20,000 times/sec is in the order of several hundred atmospheres pressure.

Surface tension in electroplating, for example, is destroyed; hydrogen is degassed instantaneously; electrolytic action is accelerated; and the entire plating process is expedited with great savings in time, labor, machinery, and chemicals. A more uniform, non-porous plating job may be expected.

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When cavitation is purposely developed, for example, to clean metal, glass, ceramic, and plastic parts which are immersed in solvent or detergent solutions, the soils, greases, chips, burrs, grit and other contaminants are literally torn away from the work by the tremendous forces associated with cold boiling. Thus the advantages of ultrasonic cleaning and degreasing systems may now be a reality for such widely diverse products as electronic components (synchros, pots, geiger tubes, etc), watch mechanisms, precision gear assemblies, miniature bearings, optical lenses, spark plug reconditioning, and cast parts or sheet metals.

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Residual Stresses in cold drawn bars, turned bars, ground bars, and heat treated steel are covered in a 32-page pocket-size booklet. In addition, discussions of fatigue and tolerances are included. Data Bulletin 16, "Residual Stresses in Cold-Finished Steel Bars and Their Effect on Manufactured Parts", is presented by LaSalle Steel Co.. Hammond, Ind., or — **Circle No. C2.**

A Chromium-Nickel-Molybdenum Stainless Steel, AM 350, can be hardened by subzero cooling or double aging to prevent excessive scaling and distortion. A booklet discusses its composition, heat treatment, annealing, fatigue strength, corrosion properties, and applications. Allegheny Ludlum Steel Corp., Pittsburgh 22, will provide copies of "AM 350, A Chromium-Nickel-Molybdenum Stainless Steel", or — **Circle Inform-A-Gram No. C3.**

The Importance of Radiography as an inspection and quality control tool is described in "A New Approach to Supervoltage Radiography". Also presented is a check list of its major characteristics to serve as a guide in the selection of the proper x-ray source. Photos of Van de Graaff components and actual unit installations are shown together with a series of performance curves, tables, bar charts, and line sketches. For a copy of Bulletin R, write to High Voltage Engineering Corp., 7 University Rd., Cambridge 38, Mass., or — **Circle No. C4.**

"Heat, Its Generation and Natural Dissipation in Hydraulic Circuits". The 8-page bulletin features useful information regarding heat transfer area, oil circulation rate, auxiliary pumps, power pumps, and pipes and valves. Included are charted test results to aid in the engineering, installation, and operation of fluid power in industry. Copies of Bulletin 90030 are made available by The Oilgear Co., 1593D, W. Pierce St., Milwaukee 4, or— **Circle Inform-A-Gram No. C5.**

A Comprehensive Stainless Fastener Data Book contains engineering data relating to the composition, properties, applications, and weights of stainless steels. Tables present the estimated weights of stainless steel bars, decimal dimensions of twist drills, etc. Another part of the book gives details on forty basic fastening devices. Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, L. I., N. Y., will supply copies of the data book, or— **Circle Inform-A-Gram No. C6.**

A Metal Cutting Manual and Wall Chart will serve as guides to superior metal cutting results. The Victor pocket-size manual contains complete information on blade types, sizes, cutting techniques, and feeds and speeds. The wall chart aids in the choice of the right blade for every job. The blades listed are hand hack saw, power hack saw, and band saw. The chart also gives hints on proper blade use and how to cure common troubles. Both the wall chart and "Metal Cutting" are supplied by Victor Saw Works, Inc., Middletown, N. Y., or — **No. C7.**

The Use of Sprayed Metal Coatings in the production of electrical and electronic equipment is covered in a new Metco bulletin. Engineering data is provided on bond strength, permissible coating thicknesses, circuit tests, and spraying methods. Bulletin 120 is obtainable from Metallizing Engineering Co., Inc., 1101 Prospect Ave., Westbury, L. I., N. Y., or — **Circle No. C8.**

A Quick-Reference Pocket Guide to Better Use of "Talide" Metal. Shown is the side of the plastic pocket guide giving the recommended grades, type of cut, and cutting speeds of the metal. Also on this side is a chart with the rake and relief angles for "Talide" metal

turning tools. On the reverse side are charts indicating suggested speeds, feeds, and depths of cut for machining steel and standard grades of the metal with recommended appublications. Metal Carbides Corp., 107 E. Indianola Ave., Youngstown 7, O., or — **Inform-A-Gram No. C9.**

"How Abrasive-Belt Grinding Increases Production" presents 46 illustrated case histories. The application studies are grouped according to each of five types of abrasive belt machining — platen, contact wheel, formed wheel, centerless, and flexible belt. The specific advantages of belt surfacing are discussed. The abrasive belt grinding application booklet is issued by Engelberg Huller Co., Inc., 831 W. Fayette St., Syracuse 4.

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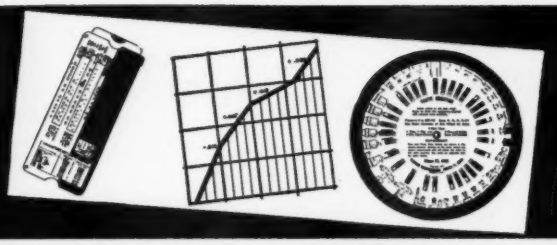

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Blade Types, Sizes, Cutting Techniques, feeds and speeds, and general metal cutting information are found in the Star Metal Cutting Manual. Coordinated with the manual is a wall chart telling how to use the best blade in the best way. Both the manual and the wall chart may be obtained from Clemson Bros., Inc., Middletown, N. Y., or— **Circle Inform-A-Gram No. C10.**

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A Pressure Conversion Chart has been issued by Consolidated Electrodynamics. Measurements are given in inches and millimeters of mercury, lbs/sq. in., lbs/sq. ft., and inches and feet of water. On the back of the chart is a pressure-conversion table and typical CEC pressure pickups. Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena 15, or— **Circle Inform-A-Gram No. C13.**

The Advantages of the American Standard ASA B46.1-1955 are listed in a new booklet. Included are a classification of surface characteristics and a brief discussion of stylus type instruments and precision reference specimens. Pages 6-9 are appendices to the Standard. For copies of this booklet, contact Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, or — **Circle No. C14.**

A Wall Chart showing proper spindle speeds with various surface speeds for aluminum stock in automatic screw machines is now available. The data covers surface speeds from 50 to 1000 fpm for ⅛" thru 5" stock dia. The proper tool angles to be used are also illustrated. The chart may be obtained from Kaiser Aluminum & Chemical Corp., Industrial Service Div'n — PR 155, 1924 Broadway, Oakland 12, Calif. or — **Circle No. C15.**

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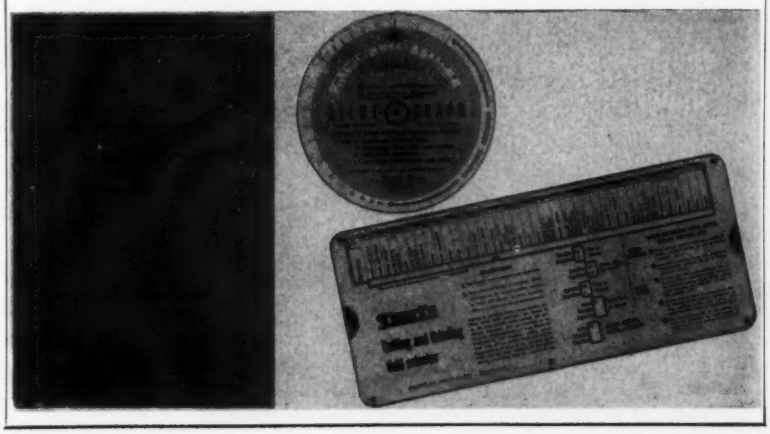

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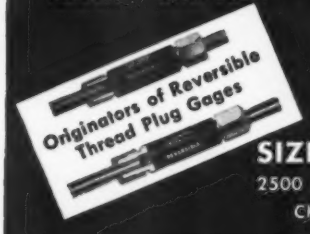

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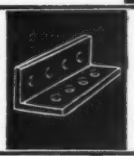

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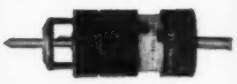

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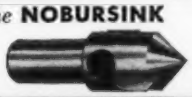

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MICROSTRUCTURES OF DIAMOND SURFACES

by S. TOLANSKY, Ph.D., D.Sc., F.R.S.

The remarkable pictures obtained by Professor Tolansky in his research laboratory and reproduced in this book (many of them never before published) enable fundamental new deductions to be made regarding the nature of diamond surfaces and therefore of the growth of diamond.

The text is written for the general reader and includes an elementary introduction to the optical techniques developed by Professor Tolansky that make such photographs possible. These techniques enable height or depth features as small as one twenty-five millionth of an inch to be resolved and effective magnifications in depth of half a million times to be made by simple and inexpensive means. One hundred and forty-three of these extraordinary pictures are reproduced as special plates in this book. $8.50* per copy.

CONTENTS:

The Optical Techniques
Some Characteristics of Diamond
The Topography of the Natural Octahedron Faces
The Nature of the Trigons
Some Growth Features on Octahedron Faces
Linear Discontinuities on Diamonds (Slip?)
The Etching of Diamond
Diamond Cleavage
Optical Shadow Casting
Percussion (Pressure) Marks on Diamond
Polished Diamond
143 Special Art Plates

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J. D. White Named President of Darwin-Milner

Darwin-Milner's
J. D. White

James D. White, Jr. has been elected president of Darwin-Milner, Inc., tool steel specialists.

Vice president and general manager of the company since 1951, Mr. White came up through the field offices of the tool steel industry to his present position. An engineering graduate of Northwestern University, he was Milwaukee branch manager for Crucible Steel before joining Darwin-Milner.

Darwin-Milner holds original patents on high carbon and high chrome die steels, the best known products of which are PRK-33 and Neor.

Necrology

George Gorton, Sr., president of the Gorton Machine Co., died at his home in Racine, Wisc., in November. Until several months ago, the 90-year-old manufacturer made daily trips to the office, although his sons, George, Charles, and James, have been in charge of active operations of the company.

Ray Olson, 39, vice president in charge of manufacturing at Federal Tool Corp., Chicago, died in an automobile accident last month.

Keith Williams, 30, a partner in the Central Forging Die Works, Chicago, died after the same accident.

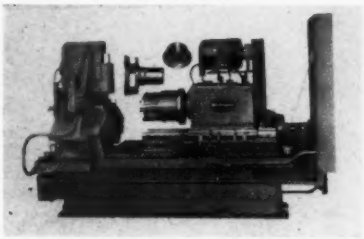
The 1500th American Standard has been approved, Vice Admiral George F. Hussey, Jr., USN (ret.), managing director of the American Standards Association disclosed recently. Number 1500, specifications for Nickel-Chromium-Iron alloy seamless pipe and tubing, was submitted by the American Society for Testing Materials.

New Gun Driller Can Eliminate Up To 6 Tools

A new high production type gun drilling machine has been designed by Michigan Drill Head Co., P. O. Box 4643, Detroit 34. With the model shown, it's possible to eliminate up to six machine tools.

The machine drills six holes (O.5102"-0.5107" dia) in a carrier gear. It drills to size within 0.005" and to location, within 0.001".

This gun driller is built to handle three totally different parts; the diameter of the largest is 12" and of the smallest, 6". It will also handle double-flanged parts in one setting, by taking advantage of a jump feed feature of the machine.



SCULLY SIGNAL CO.
turns to
PIVOT
HIGH SPEED STEEL
PUNCHES

HOW WOULD YOU SOLVE THIS PROBLEM?

Pierce 3/16" Bright Basic Steel Wire that has been coined to 1/8" flat with a 1/8" straight-walled hole. Punches made from finest shock-resistant steel available achieved runs of only 300 to 1500 pieces. Punch breakage required concurrent use of 3 different presses to maintain production.

HERE'S HOW SCULLY SIGNAL COMPANY, Melrose, Massachusetts, manufacturers of the famous Ventalarm® Signal and Ventalarm® Gauge solved the problem. For consistent production of indicating rods for tank gauges, Scully Signal Company turned to Pivot High Speed Steel Punches, straight-ground with whipsleeve.

"Production is now up to 30,000 pieces per grind and the original Pivot Punches are still being used."

Here is another instance where Pivot Punches are increasing quality and quantity of production.

Send for complete catalog on perforating and pilot punches in all shank styles, punch blanks, retainers and die buttons . . . at list prices! Write Dept. T. B.

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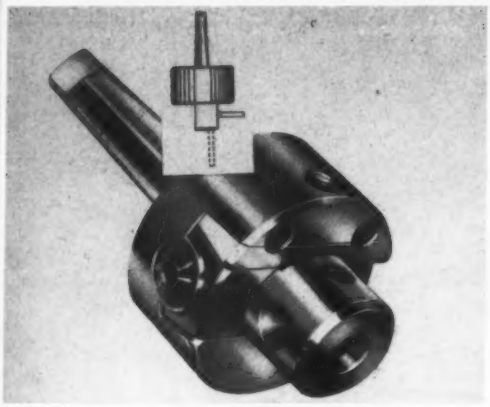
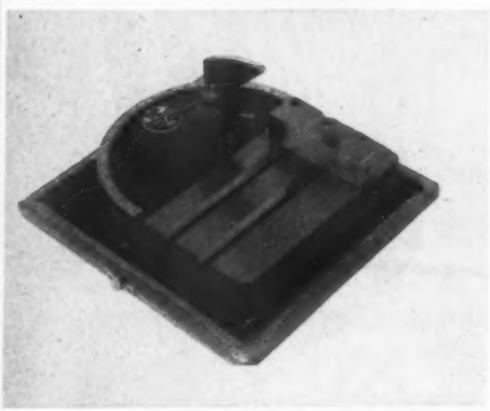
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



BORING HEAD . . .

A new boring head provides for perpendicular and parallel holding of tools. Model 43-B has a $\frac{5}{8}$" bar capacity and a built-in micrometer adjusting tool block in increments of 0.001". Flynn Mfg. Co., 133 Flowerdale, Ferndale 20, Mich., or — **Inform-A-Gram No. A1.**

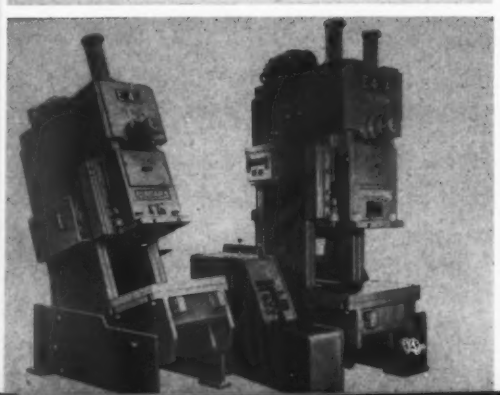


ANGLE FINDER . . .

A new precision angle finder will quickly check not only the cutting edges of single point, carbide and high speed cutting tools, but also the top rake and side clearance angles. There is no setting between tools or different size tools. KP National Sales, 1036 Terrace St., Muskegon, Mich., or — **Circle A2.**

AUTOMATION FEEDING . . .

A hydraulic gripper-type press feed is used for automatic feeding of coiled stock. Models are available for handling stock up to 36" wide x 3/16" thick in lengths up to 36". All are adjustable to take narrow width stock. Special Engineering Service, Inc., 8161 Livernois, Detroit 4, or — **Circle No. A3.**

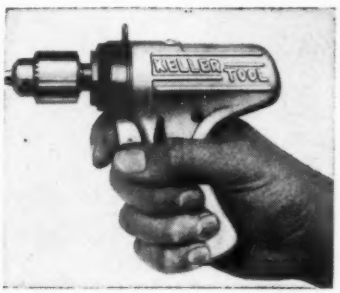


OBI PRESSES . . .

Series E single point OBI presses feature front-to-back crankshaft design. An electro-pneumatic friction clutch operates directly on the crankshaft. Built in four sizes with 75- to 200-ton capacities, Series E presses are available in standard and automation models. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. **Circle No. A4.**

INCREASED POWER . . .

A newly designed line of portable air drills features an increase in power with no increase in weight. These hand-held drills have a speed range from



600 to 17,000 rpm. Series 11A-2 drills provide capacities to ¼" and 5/16", and a complete torque range. A trigger lock holds the unit on for continuous operation and off for safety in changing drills. Keller Tool Div'n, Gardner-Denver, Grand Haven, Mich., or — **Inform-A-Gram No. A5.**

SHARPEN CARBIDES WITHOUT DIAMONDS . . .

Sharpen carbide tools by electric spark machining instead of abrasive wheels. "Method X" is made possible by a new tool sharpener, Style 43. This machine functions without diamond wheels or abrasives. "Method X" sharpener doesn't cause parallel

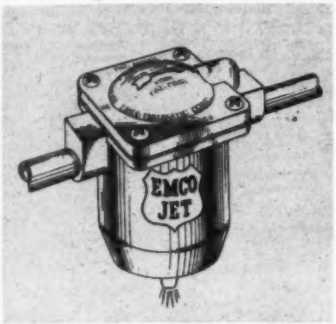
or unidirectional tool marks, heat checks, or grinding checks and will work materials of extreme hardness. It is designed primarily for off-hand sharpening of single-point solid carbide and carbide-tipped tools. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Circle No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

AIR FILTER . . .

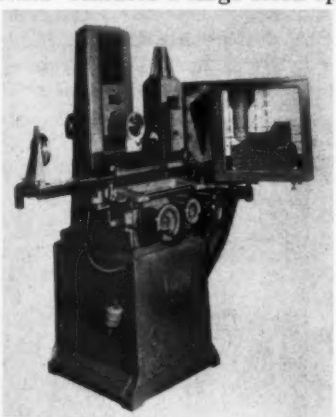
A fully automatic, self-adjusting air filter has been produced. The "Emco Jet" L200-A air filter weighing 12 oz features "point-of-use" application. It eliminates sludge, abrasive substances, rust, scale, and moisture from entering air-operated tools, preventing deterioration of "O"



rings and other vital parts and saves frequent tool replacement. The air filter has a range of from 1 cfm to 20 cfm and an operating range from 60 to 250 lbs air pressure. Model L200-A operates by the differential of pressure. Emco Pneumatic Corp., 1317-1319 Locust St., Des Moines, Iowa, or — **Circle Inform-A-Gram No. A7.**

BUILT-IN OPTICAL COMPARATOR . . .

Continuous inspection while grinding steel or tungsten carbide is possible with a precision grinding machine. The "Visual-Grind" features a large-sized op-



tical screen which is a part of the machine itself. The built-in comparator provides progressive control of tolerances. This machine is manufactured by The Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland. **Circle Inform-A-Gram No. A8.**

"PACKAGED" MOUNTS . . .

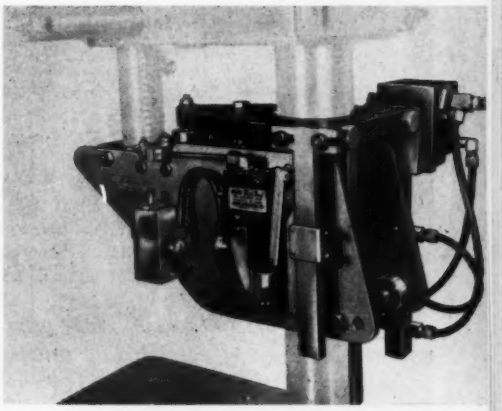
One sheet of "Air Loc" machinery mounting and one of "Air Loc" shim material are included in a package called "Packaged Flats". The material requires no bolting or cementing. The unit provides enough material to install from 1 to 3 machines. Clark, Cutler, McDermott Co., Franklin, Mass., or — **Circle A9.**

SCREW VISE . . .

Get a tight hold on larger tapered or irregular objects without damaging the work by using the Sevo III vise. The jaws consist of a series of machined and ground flat plates which hinge or swivel in any direction. Use it when filing, shaping, or drilling objects. De Wilde-Jones, Inc., P.O. Box 231, San Francisco 1, or — **Circle No. A10.**

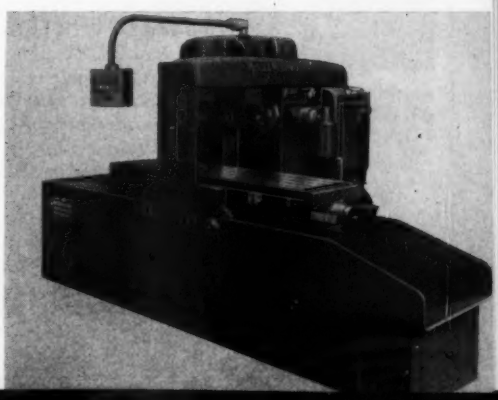
FLUID FEED . . .

An air-hydraulic drill press feed has a new oil-flow principle that adjusts the rate of feed accurately from 2″ to 60″/min. A system of hydraulic checks maintains a uniform speed regardless of break-through points. This attachment is manufactured by Mead Specialties Co., Dept. DP-93, 4114 N. Knox Ave., Chicago 41. **Inform-A-Gram No. A11.**



MILLING MACHINE . . .

A bed-type production milling machine is the Mill-M-Matic. A total of 82 spindle speeds from 25 to 1230 rpm are provided. There is an involute spline on the spindle for efficient power transmission regardless of quill position. The Motch & Merryweather Machinery Co., Machinery Mfg. Div'n, 888 E. 70th St., Cleveland 3, or **No. A12.**



Tough grinding jobs?

Check Vulcanaire high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

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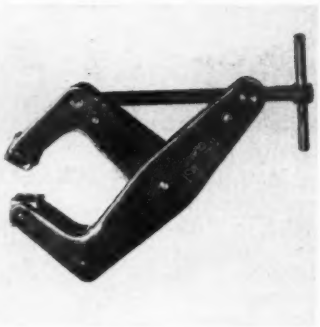
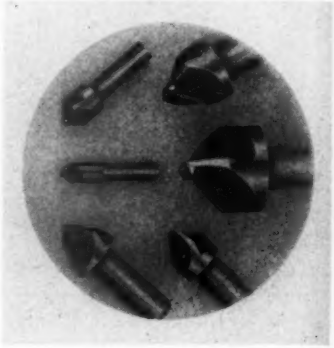
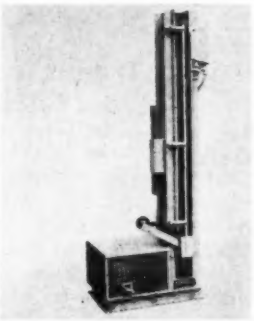


A One - Inch "Kant - Twist" Clamp is used on small precision work. Each jaw is grooved for gripping rounds, and the jaws rotate in one plane. The clamp is produced by Saxton Mfg. Co., Inc., El Monte, Calif.
Circle No. A13.

Chatter-Free Carbide Countersinking is possible with "Econo-Sinks". They're used in drill presses, screw machines, automatics, engine lathes, hand tools, and threading machines for ID deburring. Using them, there's less downtime, increased production, greater precision, and longer consistency of operation. Severance Tool Industries, Inc., 730 Iowa St., Saginaw, Mich.
Circle No. A14.





Series 4500 Elevating Conveyors have been introduced by Feedall. The conveyors transfer parts from one machine to another. Parts are accepted from the discharge chute of the first machine, elevated, and synchronized for delivery to the next. Series 4500 will handle cylindrical parts up to 3½" dia and 1½" thick. Feedall, Inc., Willoughby, O., or — **Circle No. A15.**

The "Jewel Case" of set screw ideas contains more than 30 labeled samples of set screw products. The case is loaned to design engineers and other plant officials interested in selecting set screws. Among the items included are Setko hopper-fed, self-tapping, and pivotlok set screws; nu-cup and off-set self-locking types; pipe plugs; and hexagon keys. Set Screw & Mfg. Co., 158 Main St., Bartlett, Ill., or —
Circle No. A16.

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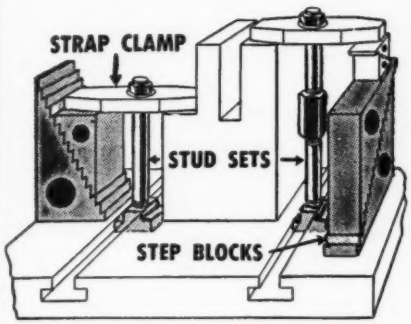

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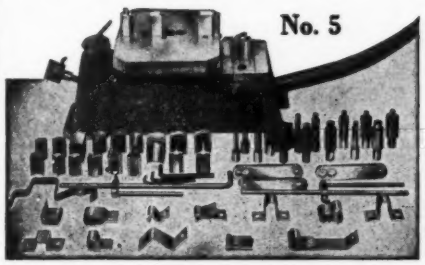

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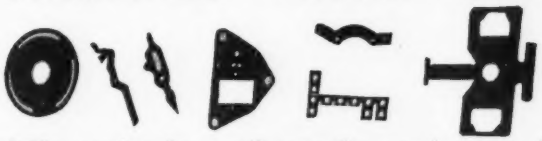

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Linden 3-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

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THE PRODUCTO MACHINE CO.
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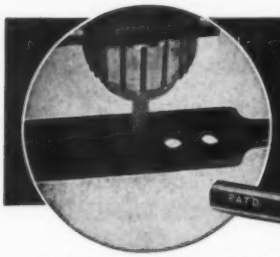

USE The New IMPROVED "HARDSTEEL" DRILL

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

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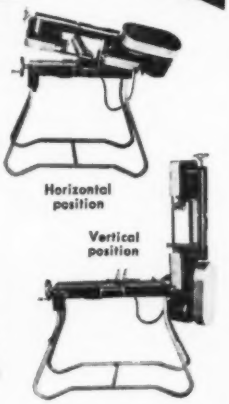
NOW YOU CAN HANDLE METAL CUT-OFF or LIGHT CONTOUR CUTTING

. . . with one economically priced saw . . .

Here's unmatched versatility in a quality built, dual-purpose band saw — the Wells 49-A. TWO saws for the price of ONE!

Use it as an efficient, money-saving horizontal cut-off saw to handle jobs up to 3½" x 6". Then, with one easy motion, convert it to a vertical band saw. Just swing head into upright position — it's ready to use. No tools required! It's handy for cutting angles and slots, and for light contour work.

The Wells 49-A is a real time and money saver in any shop or experimental lab. Write for full details or call your local Wells Distributor.



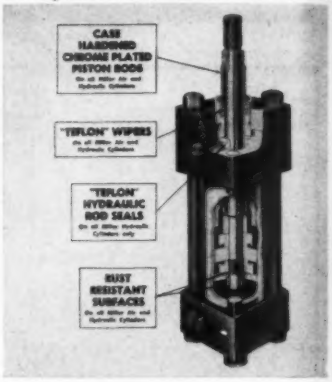
Wells

The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORP.
1040 CEDAR ST., THREE RIVERS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1662

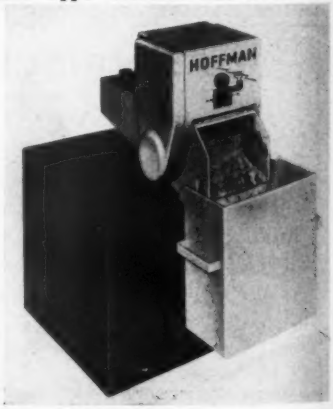
For Absolute Concentricity to the drill spindle when using small tools, use the "Micro" collet chuck. This adjustable collet chuck is available with two different size collets — the smaller for diameters 0.005" to 0.025", the larger for diameters 0.020" to 0.040". Detroit Cam & Tool Co., 2305 Goodrich Ave., Ferndale 20, Mich., or —**Circle No. A17.**

New Standard Power Cylinder Features have been adopted by Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill. They include case-hardened, chrome-plated piston rods; Teflon rod wipers and hydraulic rod seals which withstand −100°F to +500°F temperatures; and black oxide finish for rust protection. **Circle No. A18.**



A Solenoid and Cover Assembly has been built to JIC standards by Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3. For use on Ross base mounted introld valves, it can be applied to 3- and 4-way types and to sizes ¼" through 1¼". The assembly protects the solenoid from dust, splashing liquids, etc. **Circle No. A19.**

A Magnetic Separator Type Clarifier has been designed for automatic cleaning of machine tool coolants. "Roto-Flow 15 Magna Grip" assures better finishes, fewer rejects, longer wheel or tool life, and less downtime. It can be mounted on coolant tank facilities or any part of the machine. U. S. Hoffman Machinery Corp., 105 — 4th Ave., New York 3, or — **Circle A20.**



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This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

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CIRCLE INFORM-A-GRAM KEY NO. 1672

MAGNIFIES
"Hard-to Read"
Vernier Scales
on Height Gages and Calipers

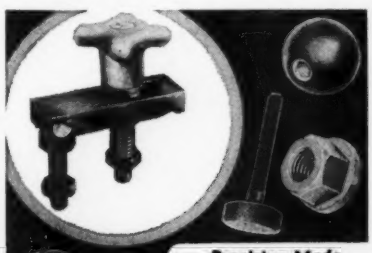
MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. **S No. 100** for 6" Vernier Calipers; **S No. 200** for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; **S No. 300** for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.

For Complete Information Write, Phone or Wire

STEBAR COMPANY
217 28th Ave. Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1673



Precision-Made

FIXTURE CLAMPS & DETAILS

Heat-treated and Corrosion Resistant

QUICK SERVICE

CATALOG AVAILABLE

HARCO **HARCO ENGINEERING**

12092 Woodbine Detroit 39, Mich.
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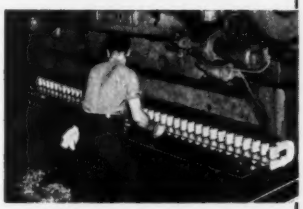
CIRCLE INFORM-A-GRAM KEY NO. 1674

GUARANTEED

Reduced Press Down-Time with TOOLSET

. . . Your opportunity for BIGGER PROFITS



Do as Morrison Railway Supply Corp. of Buffalo, N. Y. did . . . they reduced press down-time on this forty punch job to 45 minutes, a saving of more than 90% by using TOOLSET self-contained units in place of fixed dies. The TOOLSET punches required only 2 hrs. set-up time outside the press.

This is only one profit building feature that you get with TOOLSET units, here are more:

- **Low Initial Cost**
- **Fast Set Up By Unskilled Labor**
- **Eliminate Costly Fixed Die Sets**
- **Tooling Reusable, Set-Up After Set-Up**

. . . These cumulative savings result in a substantial lowering of per piece part cost. And, in most cases, Toolset Units permit you to render faster service . . . a bonus feature in better customer relations.

Toolset Hole Punching and Notching Units are available in seven widths from ¾" to 3½"; throat depths from 4" to 16". Punches available in round, square, rectangular, obround or special shapes as required.

Start cutting costs NOW
Send coupon for Catalog of complete Toolset Line

TOOLSET
Inc.
2181 Elmwood Ave., Buffalo, N. Y.

TOOLSET, INC.
2181 Elmwood Ave., Buffalo 7, N. Y.

Gentlemen:
Please furnish a copy of your Catalog on Hole Punching and Notching Units.

Name .....
Title .....
Firm .....
Address .....
City .....
Zone..... **State**.....

CIRCLE INFORM-A-GRAM KEY NO. 1675

YESTERDAY'S PIONEER · · · TODAY'S LEADER

NEW!

WELDON
Axial
Relieving Fixture

• This fixture lends itself to the sharpening of end relieved cutting tools—often referred to as tools with axial relief. The longitudinal movement of the spindle is created by a cam which is mounted on the spindle.

This fixture is especially adapted to the sharpening of Weldon single cutting edge countersinks and deburring tools.

Write for complete details.

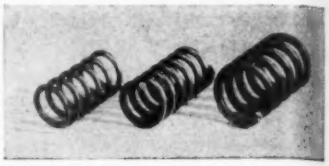
Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

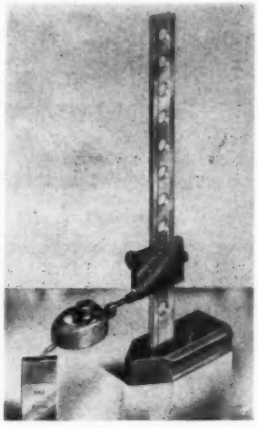
THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1681

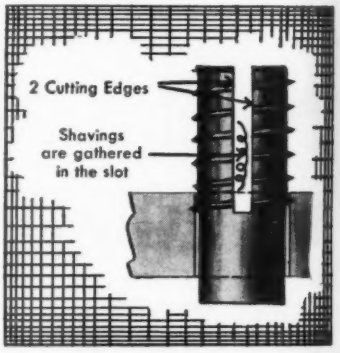
Eliminate Costly Hand Winding with ready-wound compression springs made from music wire. They come in 26 sizes, ranging from 0.032" dia to 0.115" dia and are 10" long. They're designed to fit into holes and over rods. Springs in 30 smaller sizes are also available. Reid Tool Supply Co., Muskegon Heights, Mich. **Circle No. A21.**





Transfer Dimensions and measure otherwise inaccessible places with the Minikator No. 590, micro-indicator. It is suitable for indicating out-of-roundness or concentricity of grinding machine spindles and for locating drilling jigs. Measuring points of two different lengths 1/16" dia. are supplied. The instrument is shown with a new height gage. C. E. Johansson Gage Co., 10641 Haggerty, Dearborn 1, Mich., or — **Inform-A-Gram No. A22.**

Setko Self-Tapping Set Screws are available in a full range of sizes. The set screws are also self-aligning and self-locking. The cutting thread extends only around the top section and has two cutting edges. The shavings are gathered in the slot. The screws can be used on metal or plastic products. Set Screw & Mfg. Co., 158 Main St., Bartlett, Ill., or — **Circle No. A23.**



Inspection of Spur or Helical Internal Gears up to 18" pitch dia is performed by the Red Ring Gear checker. Model Sig-18-in. checks tooth-to-tooth spacing, pitch or root diameter eccentricity, and size, as well as parallelism of spur gears. National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, or — **Circle No. A24.**

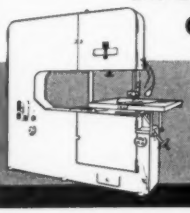
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

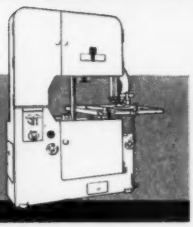
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE **TANNEWITZ WORKS**

GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1691

When New Molds Stick use IMS SILICONE FLUID

For Better Tool and Die Lubrication!

Shorten costly break-in periods! Simply spray on this perfect parting agent from self-dispensing aerosol! Useful too in PATTERN MAKING — releases patterns from master molds with minimum surface defects. Remember . . .

WHERE ANYTHING STICKS
it always pays to try
IMS SILICONE SPRAY

Get new tools into production sooner. Keep a few cans handy all the time. Order today!

DELIVERED PRICES
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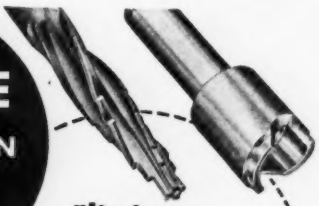
REDUCE PRODUCTION COSTS



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Carbide and High Speed

Step drills, step reamers, milling cutters, seating and grooving tools, trepanning tools, form tools, carbide and high speed, made to your specs or designed by our engineers to fit your needs. Form ground with "radial relief" gives up to 500% more tool life, imparts smoother finishes on piece parts. Send for details.

SPIRAL STEP TOOL COMPANY
Designers and Manufacturers of All Types of Special Cutting Tools
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WORLD'S HARDEST METAL

IMPROVED QUALITY

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

METAL CARBIDES CORP., YOUNGSTOWN 7, OHIO
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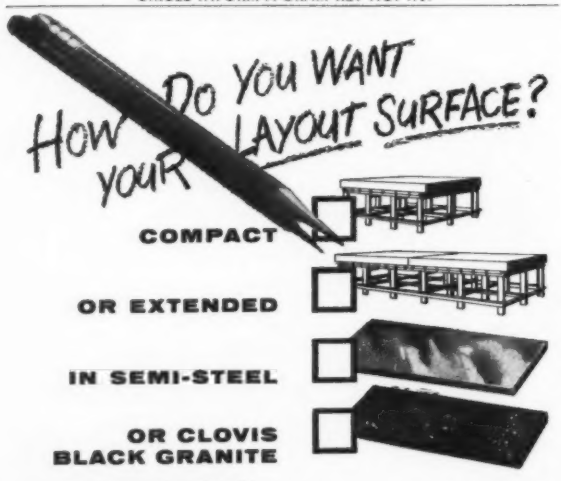
METAL CARBIDES CORPORATION MC TALIDE® YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 1701

How Do You WANT YOUR LAYOUT SURFACE?



COMPACT
OR EXTENDED
IN SEMI-STEEL
OR CLOVIS BLACK GRANITE

CHALLENGE LAYOUT SURFACE PLATES MEET EVERY REQUIREMENT

Available with grooving, scoring, or "T-Slots". In a complete range of standard sizes. Other sizes to order.

You name it . . . Challenge has it! A complete line of Layout Surface Plates in single plate units or multiple sections grooved and keyed into one large flat surface . . . made of special analysis semi-steel or new Clovis Black Granite. Whatever your preference, Challenge Layout Surface Plates provide the unyielding strength and accuracy you need for precision engineering.

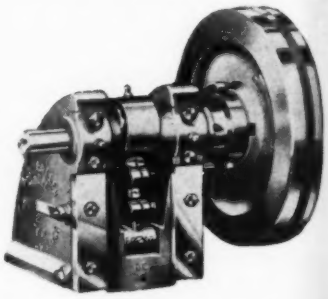
Write for the new Challenge Catalog.

783

Challenge THE CHALLENGE MACHINERY CO.
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN

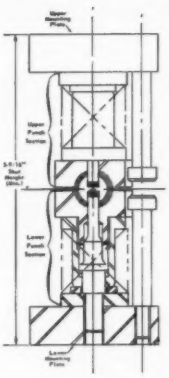
CIRCLE INFORM-A-GRAM KEY NO. 1702

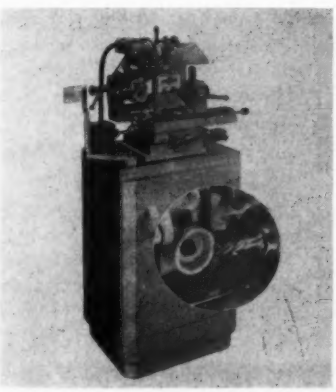
Punching, Shearing, forming, riveting, blanking, etc. operations can be performed by a 2-ton half-press. Model B-2-A can be mounted on a column and base to give added working space. On continuous operation, it will mass produce up to 300 operations/min. Alva Allen Industries, Clinton, Mo., or — **Circle No. A25.**



Center Lapping of workpieces eliminates the distortion caused by heat treat, scale, or scored centers. An Ex-Cell-O center lapping machine has an adjustable work rest to handle various lengths of workpieces. A lapping stone dresser is provided with the machine. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **Inform-A-Gram No. A26.**

Double-Acting Tube Piercing Units can be used in press brakes and punch presses. They're designed to eliminate many troublesome problems met in short and long run punching of tubing. The capacities of the units are ½" to 1" OD tube; 0.312" maximum punch dia; and maximum wall thickness, 0.093". Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y., or— **Circle No. A27.**





A New Type Grinder for end mills and other small tools has been developed. The "Centra-Point" end mill grinder features a simplified method for grinding helical cutters. Mechanical wheel dressing by built-in diamond truing tools insures a perfect wheel radius. William H. Field Co., Inc., 325 Dorchester Ave., Boston 27.
Circle No. A28.

compare YOUR drill fixture COSTS with ANCHOR BUSHING templates

Anchor Bushing drill templates, using sheet metal or laminate plastic materials, are made flat or in compound curved forms at a fraction of cost and time required for similar conventional drill fixtures.

Your TOOLING COSTS are reduced in simplified design and fabricating methods. Your MATERIAL DOLLARS go further by using inexpensive hardened steel Anchor Bushings and sheet metal or plastic materials. Your PRODUCTION JOB TIME is conserved since lightweight Anchor Bushing templates reduce worker fatigue and storage problems.

Compare your drill tooling methods, as have leading aircraft tooling departments, with the Anchor Bushing Method.

Ask today for our Anchor Bushing Catalog – it describes methods, bushing styles, sizes and prices.

Solar Aircraft Company, San Diego, craftsmen use contoured Anchor Bushing drill template on nacelle of Lockheed P2V Neptune aircraft.

Standard Anchor Bushings for rivet or spot weld attachment to sheet metal or fiberglas.

Nutplate Anchor Bushings provide three coordinated screw and rivet attachment holes in one bushing.

One piece Anchor Bushings for laminate plastic materials. Imbedded into plastic before heat hardening process.

THE *hi-shear* RIVET TOOL COMPANY

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HAND KNOBS

6 SIZES

CAST IRON

Tapped, Reamed or Blank.

Hex-shaped hub for extra tightening.

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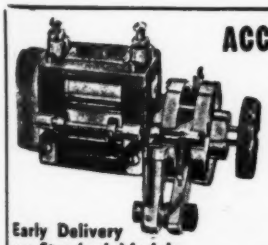

ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO
12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

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Punches and Dies

...for foot and power presses

Standard Punches and Dies of all sizes and shapes in stock—or made promptly to order. Also Adaptors and Die Shoes to convert your press. For power, foot or hand operation.

Round, square, rectangular, slotting, notching, louvre, angle, multiple, knock-out and other shapes. Precision made from high grade tool steel. More than 25,000 sets in stock to choose from.

Send for free illustrated catalog No. 154-AF NET PRICE SHOWN! *What are your punch and die needs?*

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Controlled Quality
CARBIDES

for greater Production Economy

From start to finish, NEWCOMER CARBIDES are made in our own plant . . . to high controlled-quality standards.

NEWCOMER CARBIDES are made to give you greater production economy through heavier feeds, faster cutting speeds and greater wear resistance than most other carbides. Complete stocks of standard carbide blanks, cutting tools, and mechanically-held tools are available for ready delivery.
For your particular cutting problem, consult a Newcomer Tool Engineer . . . there's one located near you.

NP CONTROLLED QUALITY CARBIDE

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Latrobe, Pa.
General Sales Office:
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Since 1903
black devil
TWIST DRILLS—REAMERS
Ever since 1903, when Celfor pioneered in the forging and hot-twisting of high speed drills, "Celfor" tools have been specified by the nation's leading steel fabricators for the drilling and reaming of the really rugged jobs in the toughest alloy steels.
CELFOR TOOL COMPANY
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.
MAKERS OF "REPUBLIC," "CENTURY," "CELFOR" AND "U. S. EAGLE" BRAND TOOLS
3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

NEW YORK PLANT
100 LAFAYETTE ST., NEW YORK 13, N. Y.

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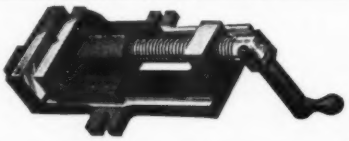

YOST DRILL PRESS VISE
• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.
OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
Write today for bulletin on the extensive Yost line
YOST MFG. COMPANY
124 Grant St.
Cambridge Springs, Pa.

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CAMS ALL TYPES MADE TO YOUR SPECS

Charles Eisler Jr.
President
EISLER ENGINEERING CO., INC.
732 SO. 13TH ST., NEWARK 3, N. J.

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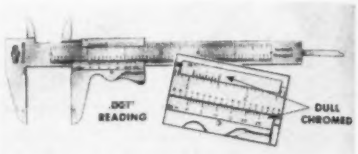
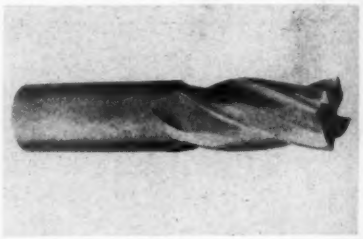
A Stainless Steel Vernier Caliper that is rustproof has been developed. The Mauser caliper has a dull-chrome finish on the vernier scales which eliminates glare and reflec-



tion, resulting in faster, more accurate readings and measurements. George Scherr, Inc., 200 Lafayette St., New York 12, or —**Circle A29.**

Machine Ground Solid Carbide End Mills have uniformly accurate flute form and a constant relief angle. The new line of end mills includes straight shank styles with two or four flutes, straight or right



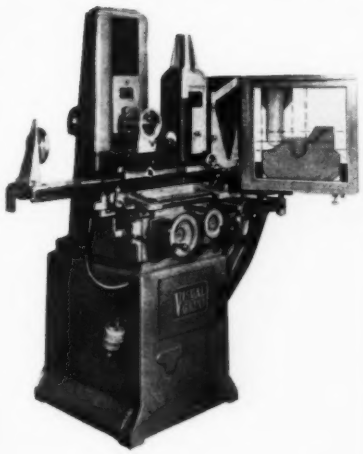
hand spiral, with square or ball ends. They're used for rough and finish machining of ferrous, non-ferrous, and non-metallic materials. M. A. Ford Mfg. Co., Inc., 817 W. River St., Davenport, Iowa, or —
Circle Inform-A-Gram No. A30.

Quick Cutting-Tool Changes for different machining operations on 10" EE lathes are possible with the "Quik Tool." This tool block automatically positions any of numerous tool holders developed for this purpose. The operator merely slips the holder over a locating pin and swings

it into a slot in the block; no alignment or clamping is needed. It is intended for use where a wide variety of lathe operations are performed. Each "Quik-Tool" set of seven basic tool holders is supplied with a rack to be mounted on the rear of the lathe. The Monarch Machine Tool Co., Sidney, O., or —
Circle Inform-A-Gram No. A31.

if your production calls for PRECISION

you need this VISUAL-GRIND



It provides an entirely new concept accurate, surface form - grinding on tool steels or tungsten Carbide. The operator simply works to the templet • • • • on the screen which acts as a constant comparator providing continuous inspection.

We invite your technicians to visit our plant for operational demonstrations. . . . Or write for new technical literature.

THE CLEVELAND GRINDING MACHINE CO.

1643 EDDY ROAD • CLEVELAND 12, OHIO

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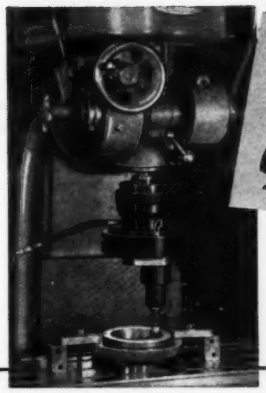
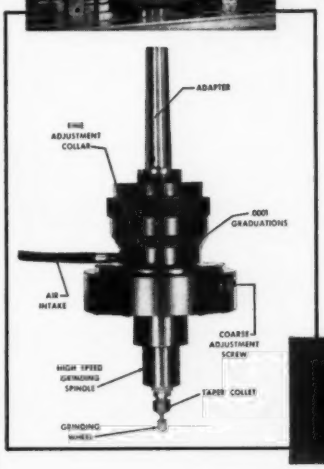


Grind Precision Holes *without* STOPPING the SPINDLE



You can save a lot of time in precision grinding with Grind-A-Matic, the new air-driven head. Unlike other comparable units, radial feed may be increased in increments of .0001" as grinding proceeds. You don't have to stop the spindle every time. Just turn the adjustment collar.

Used as a tool in any jig bore, boring mill, lathe or vertical mill, it gives you high production with the precision of a jig grinder.

Grind-A-Matic grinds holes ⅛ to 2½ inches in diameter with standard equipment. An auxiliary mounting arm increases this range to 4 inches.

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7197

PERFEX GAGE & TOOL CO.

123 AVERY ST. • MT. CLEMENS, MICH.

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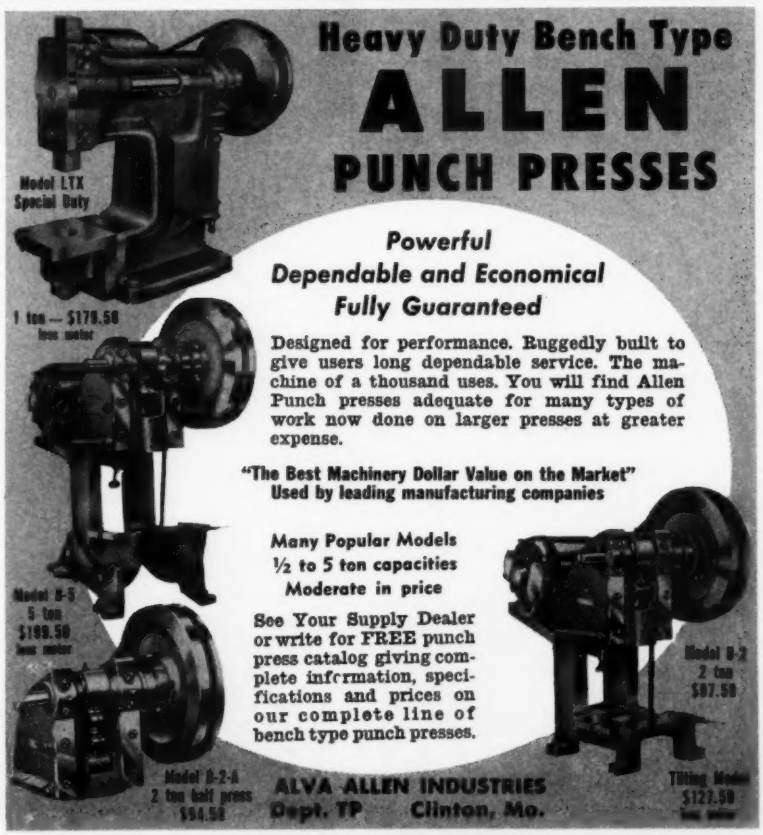
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ALLEN
PUNCH PRESSES
Model LTX Special Duty
1 ton — $179.50 less motor
Powerful
Dependable and Economical
Fully Guaranteed
Designed for performance. Ruggedly built to give users long dependable service. The machine of a thousand uses. You will find Allen Punch presses adequate for many types of work now done on larger presses at greater expense.
"The Best Machinery Dollar Value on the Market"
Used by leading manufacturing companies
Many Popular Models
½ to 5 ton capacities
Moderate in price
See Your Supply Dealer or write for FREE punch press catalog giving complete information, specifications and prices on our complete line of bench type punch presses.
Model B-5 5 ton $199.50 less motor
Model B-2 2 ton $87.50
Model B-2-A 2 ton half press $94.50
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ALVA ALLEN INDUSTRIES
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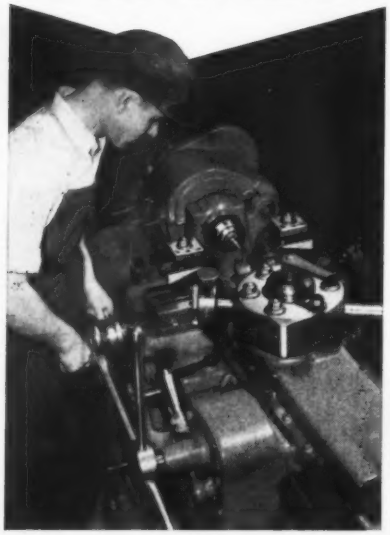
A Better Value

SOUTH BEND

2-H TURRET LATHES



South Bend 2-H Turret Lathes have the stamina for exacting close-tolerance work, rigidity for producing fine finishes and ample power for smooth performance. Gear box provides 48 power feeds each for turret ram, universal carriage and double tool cross slide. Such a wide selection of feeds insures all-job range. Where can you find a better turret lathe value? Write for information on this fine machine.

SPECIFICATIONS

Spindle Hole—1⅜". **Collet Capacity**—1". **Swing**—16¼". **Spindle Speeds**—20 to 945 r.p.m. **Turret Feed**—5⅛". **Dia. Turret Holes**—1½". **Thread Range**—4 to 224 per in. **Motor (2-speed)**—2, 1 h.p.

▶ **$3350** Illustrated, less electrical equipment and tooling, f.o.b. factory. Low down payment. Only 3¼% annual interest on original unpaid balance due.

SOUTH BEND LATHES

SOUTH BEND 22, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1741

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

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Portable Band Saw Blade Welder

ASSURES PERFECT, UNBREAKABLE WELDS EVERY TIME!

Employs New *Vibra-Forge* Principle!

BREN-WELD MODEL M 3/4" CAPACITY

Built-in grinder removes flash . . . Double gauge checks flat saw widths . . . Butt-welds all saw blades from 1/16" to 3/4". Handles intricate tool and die and power cut-off saws. Additional features of this fully-automatic welder:

- PERFECT WELDS
- NO BREAKAGE
- NO FAILURES
- WEIGHS ONLY 35 LBS.
- OPERATES ON 110 V, A.C.
- UNCONDITIONALLY GUARANTEED

Size: 7½" x 12" x 7" LIST PRICE $169.50 (F.O.B., L. I. C., N. Y.)

24 HOUR DELIVERY FROM STOCK

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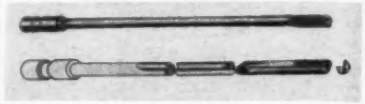
Check Surface Variations with a portable bench center. This miniature precision bench center indicates shoulder variations on a small (2½" long) machined part. Transicoil Corp., Worcester, Pa., or — **Circle Inform-A-Gram No. A32.**

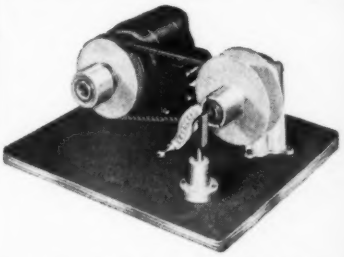
Drill Both Shallow and Deep Holes with a carbide gun drill. This drill can be used as a boring tool on high speed boring or drilling spindles and on special deep hole or rifle-drilling



machines. Its use results in reduced cost, minimized runout, better finish, and increased production. Chicago-Latrobe, 411 W. Ontario St., Chicago 10, or — **Circle No. A33.**

Eliminate Hand Indexing and traversing with the Cash standard hydraulic turret drive. It is quickly and easily adapted to any standard ram-type lathe, Nos. 1, 2, 3, 4, or 5. The drive also reduces rejects and tool breakage, increases tool life, and assures improved finishes. Tolerances of ± 0.001" are maintained. A. W. Cash Co., P. O. Box 551, Decatur, Ill., or — **Circle No. A34.**

A New Compound Drive Variable Speed Pulley maintains constant belt alignment through the entire speed range of 8:1 ratio. Although designed for new machines, it can be used to replace less effective

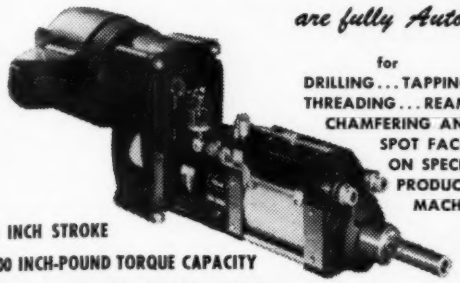


units now in use. Available in a spring loaded or manually operated design, the pulley can be mounted on one side or alternate sides. Lovejoy Flexible Coupling Co., 4819 W. Lake St., Chicago 44, or — **Circle Inform-A-Gram No. A35.**

Two Models of LeBlond lathes are the 15" dual drive lathe and the 16" heavy duty engine lathe. The dual drive lathe features a combination gear-belt drive headstock which provides 16 spindle speeds from 30 to 2400 rpm. The heavy duty engine lathe offers 27 spindle speeds from 16 to 2000 rpm. The heavier apron incorporates four-directional power rapid traverse. The R. K. LeBlond Machine Tool Co., Cincinnati 8, or — **Circle Inform-A-Gram No. A36.**

THE Hause Holomatic DRILL UNITS

are fully Automatic



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4 INCH STROKE
200 INCH-POUND TORQUE CAPACITY
300 to 15,000 RPM SPINDLE SPEEDS

AIR ACTUATED HYDRAULIC FEED
FOUR MODELS TO CHOOSE FROM

The Hause Holomatic Drill Units use shop air line pressures for thrust and feature a self-contained hydraulic system for positive spindle travel control and feed regulation. Rapid traverse distances and feed rates are infinitely adjustable in both advance and retract movements of each cycle. Automatic, semi-automatic or manual cycling, skip-drilling, manual jogging and positive stop with dwell operations are all easily achieved. A built-in air control valve simplifies set-up and reduces installation costs. All models mount at any angle.

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MONTPELIER, OHIO

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ACE DRILL BUSHINGS are always a sure bet!

- *Quality* • *Accuracy*
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Over 22,000 sizes, types and specifications in A.S.A. and ACE standards, micro and super sizes plus bushings for embedment in plastic or castable material.

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DUSTKOP STOPS DUST

DUST COLLECTOR

37 STANDARD MODELS

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Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

Also a complete line of Mist Collectors

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3 SIZES – ALL WILL TAKE 6" WIDE STOCK.
24" diameter $85.00
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Guaranteed – money back if not 100% satisfied

New LOW prices on the JACO 3-inch and 6-inch SCRAP CHOPPER

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Flute Grinder

SHARPENS AT LOWEST COST

Taps, Saws, Reamers, Woodruff Key Cutters, Milling Cutters.

Grinds straight flutes, spiral points, and sharpens saws in gang.

Takes saws from 1/2" to 8" diameter, in gangs up to 3 3/4" long — automatically indexes. Takes reamers down to 1/16" diameter.

No special skill needed. Wardwell 50 F starts making money for you the very first day.

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AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
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• 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

$14.75 PPD

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WE'LL PROVE IT WITH A FREE DEMONSTRATION!

Now . . . a low-cost universal work holding fixture for use on lathes and most other machine tools! Attachments shown below hold any round or irregularly shaped part, position it fast and accurately for any operation. Users report big savings! Accurate to .001".

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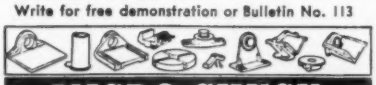

MICRO-CHUCK
Division, SCOTT-BROWNE CORP.
Batavia Pike • Newtown, Ohio

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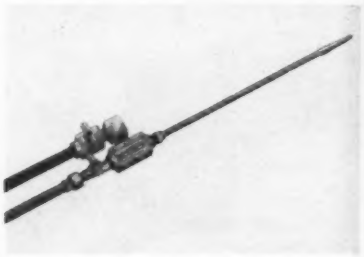
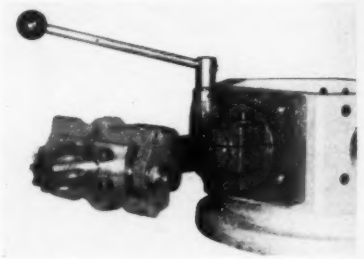
More Accurate Control of mist and operating area is possible with a new version of the Milford "Atom-Lube" mist cooling and lubricating system. A ⅛" nozzle improves operations requiring a light-to-moderate mist lubricant over a small or



confined area. The system can be applied to saws, drills, abrasive belts, grinding wheels, and a wide variety of cutting tools. The Henry G. Thompson & Son Co., New Haven, Conn., or —**Inform-A-Gram No. A37.**

A Portable Drill Press makes it easy to drill, ream, or tap in places other drill presses can't reach or work. The "BUX" magnetic drill press has a 10" stroke for a drilling capacity up to 1½" holes. It also is used for doweling and countersinking of structural shapes, bar stock, jigs and fixtures, dies, and machinery. Factory Tool Supply Co., Ferndale, Mich., or — **Circle Inform-A-Gram No. A38.**

Replace Up To 15 Individual Holders by using two new "Tru-Hole" heavy duty tap holders. Two sets of adjustable jaws cover ranges of tap squares ⅞" to 2" and 2" to 3⅛". When used on a turret lathe, the



holders permit sideway adjustment of the tap to compensate for inaccuracies of the indexing mechanism. E. F. Vilter Co., 4161 N. Richards St., Milwaukee 12, or — **Circle A39.**

Produce Close Tolerances, increase production, and save labor with the Model 48-W Bridgeport abrasive cut-off machine. This machine incorporates many automatic features. An air cylinder and Hydro-Check actuate the head. For further details on this machine, contact Lobdell Div'n, United Engineering and Foundry Co., Wilmington 99, Del., or — **Circle Inform-A-Gram No. A40.**

TIME SAVERS for the Tool Room
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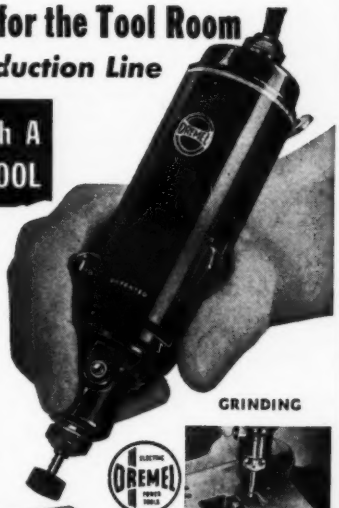
Do It Faster With A DREMEL MOTO-TOOL

With DREMEL you can polish, grind, de-burr, sharpen without tearing down set-ups. Moto-Tool is the fastest, most powerful tool in its class. Easy to use as a pencil (dynamically balanced and weighs only 13 oz.). Put the DREMEL to work. See how it pays off in speed, convenience and time savings!

APPROXIMATELY 27,000 R.P.M.

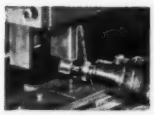
MOTO-TOOL NO. 2, with one emery wheel point $17.85

MOTO-TOOL KIT NO. 2, with 23 accessories (high speed steel cutters) and Model 2 Moto-Tool in sturdy steel case $25.95

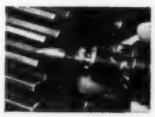


GRINDING

SHARPENING



DE-BURRING



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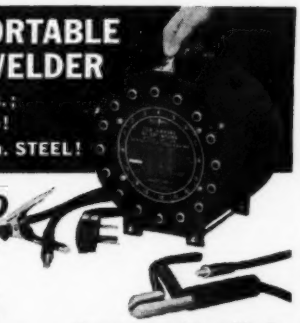
CIRCLE INFORM-A-GRAM KEY NO. 1771

FIRST TRULY PORTABLE 200 AMP. ARC WELDER

Weighs only 65 lbs.; carry it to the job!

WELDS 2 PIECES OF 1½ in. STEEL!



BREN-WELD TRADE MARK

MODEL 200 AW

Featuring the new

TRANSOIDAL

(A development of the toroidal coil)

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(Fully protected by patent applications)

Obsoletes All Other Welders of Comparable Rating!

The portable BREN/WELD does the work of conventional welders 4 to 5 times its size and weight. Eliminates the necessity to transport bulky equipment or heavy parts to be welded.

BREN/WELD handles electrodes from 3/32" through 5/32"; it has adjustable arc voltage for various arc characteristics.

BREN/WELD is ideal for plant production and maintenance, construction work, railroads, on the farm and in home workshops.

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- Also Available For 220/440 Volts
- Simple To Use—Fully Guaranteed
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11" x 12" x 7½"

List Price $169.50

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Lowest Price on Market for Comparable Ampere Rating

FREE! For details of free trial offer and folder see your dealer or write directly.

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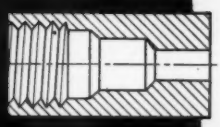

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Production costs swing down because step drills made to your specifications are only slightly more in cost than a simple twist drill.

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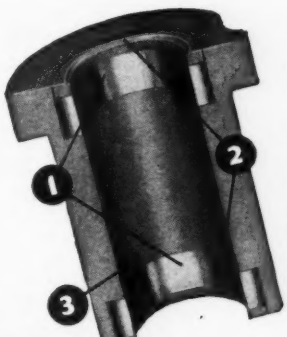

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How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

ESTABLISHED 1888

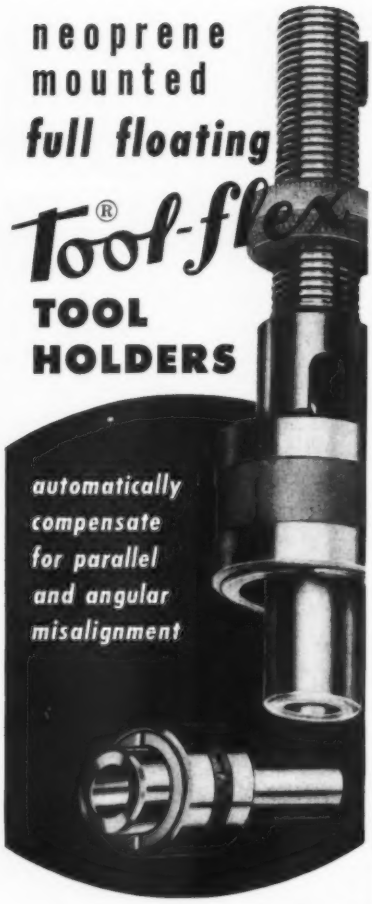
W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1774

neoprene mounted full floating

Tool-flex®

TOOL HOLDERS



The oil, heat and wear resistant Neoprene insert, found only in "Tool-flex", provides a universal float that corrects for both parallel and angular misalignment. This assures quick set-ups and minimizes scrap due to bell mouthed and oversized holes or torn and oversized threads. By floating reamers, taps, etc., in a cushion of Neoprene, tool life is increased. Available in a range of sizes and models to suit any requirements, including close centers and Acme threaded shank for multiple spindle setups. "Tool-flex" holders are fully guaranteed.

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CAMS— ALL TYPES
to your specifications
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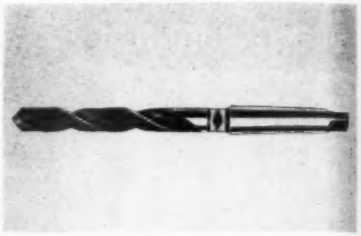
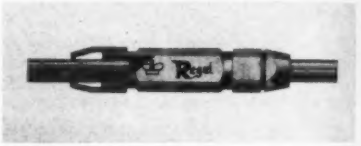
Cobalt High Speed Drills have been designed for materials with work hardening properties. These materials include stainless steels, manganese steels, armor plate, silicon-chromium, and valve steels. The



Hercules cobalt drills are engineered for use where drills of conventional high speed steels may not perform satisfactorily. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich., or — **Circle No. A41.**

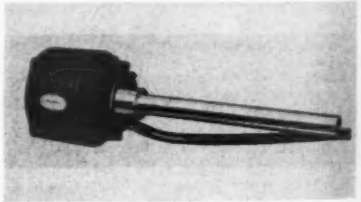
Tungsten Carbide Plug Gages have been added to the Regal line of taps, drills, and gages. They feature an accurate life up to 50 times greater than similar steel gages. As the ends become worn, they can be reversed or cut off. Collet type construction permits accurate gaging of



hole depths as well as size. Regal Div'n, Beloit Tool Corp., Beloit, Wis., or — **Inform-A-Gram No. A42.**

A Huck and Hi-Shear Conversion Unit for standard "Drivmatic" automatic drill riveting machines has been developed. This unit replaces the entire lower ram and provides a clear opening between the anvils of 8". General Riveters, Inc., 785 Hertel Ave., Buffalo 7, or — **No. A43.**

An Automatic Collet Closer provides hollow spindle lathes and other rotating hollow spindle machines with automatic or semi-automatic stock holding machines or semi-automatic stock holding. Collets may be opened and closed instant-



ly without stopping the machine. Variations in stock size don't affect the action of Model BCC-60. Holding pressures don't vary from piece to piece. The Bellows Co., Akron 9, O., or — **Inform-A-Gram No. A44.**

Expensive Equipment
IS NOT NECESSARY
to Remove Broken Taps

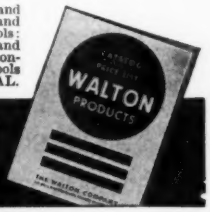
The majority of broken taps, which cause such a waste of time and production—**can easily be removed** without resorting to expensive machines and equipment.

WALTON TAP EXTRACTORS
REMOVE BROKEN TAPS
QUICKLY • EASILY • INEXPENSIVELY

2, 3, 4, Flute Styles. In sizes No. 4 to 1 ½".

This **Specialized Walton Tool** will back out most broken taps, without damage to threads or the work. Its value has been proven by its extensive and continued use throughout the metal working industry.

Send for descriptive bulletin and price list No. 38 listing these and other Walton Specialized Tools: Tap Extensions, "REPS" Pipe and Stud Extractors, and "Walton-American" Tool Holders. All tools offered for a 30 day FREE TRIAL.



The WALTON Company
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CIRCLE INFORM-A-GRAM KEY NO. 1791

MAYLINE

Durability--is built into Mayline Metal Plan Files

MAYLINE MAYLINE

Electrically welded heavy gauge steel protects and supports your drawings. Special roller bearings and channels provide fingertip control of drawers.

Strength, durability, efficiency, ease of operation — all Mayline Features. Protect your time and money investment in drawings. Use Mayline Metal Plan Files.

MAYLINE COMPANY
635 No. Commerce St. Sheboygan, Wis.

MAYLINE

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CARBIDE TOOLS
Precisionized by
GRAWELL

Grawell craftsmanship is inherent in Grawell Solid Carbide Tools . . . years of experience is reflected in the precision and long service life of these fine drills, end mills, reamers, grinding tools, centerlaps and burrs.

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GRAWELL CARBIDE TOOL COMPANY
5680 12th ST., DETROIT 8, MICH.

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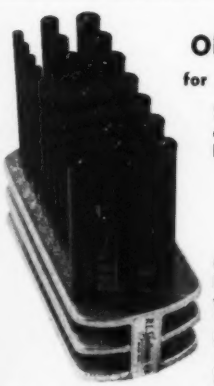

A MATCHED SET OF TRANSFER PUNCHES
for toolmakers, machinists and tool cribs

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Single Sizes Available
.0025 undersize to facilitate use.
Precision made of finest tool steel.

Carefully heat treated and tempered for long life. SET No. 3-17: 28 punches with indexed stand — Sizes 3/32" to ½" by 1/64" plus 17/32" size — length 4⅞". PRICE, only $16.80

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STUDY.... these outstanding features of the New CHESTERMAN Vernier Height Gage

The Most significant advance in a quarter Century of HEIGHT GAGE DESIGN

EASY READING 2-1/2" LONG VERNIER
RAPID QUICK ADJUSTMENT
TOP VIEW
TRIANGULAR SCALE BEAM for Superior Strength and Rigidity, preventing sway and vibration.
FINE ADJUSTMENT THRU SCREW ON BASE
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Sizes Available
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GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
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LOAD GUARANTEE

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- Nothing to wear out—nothing to maintain.
- Moves heavy, bulky machines in hours instead of days.
- Cuts moving costs 80%.
- Mighty Mover heavy duty dollies have two 4-inch roller bearing cast iron wheels, tough top plate that swivels 360°.

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MIGHTY MOVER COMPANY
1487 S. Milwaukee St. • Denver 10, Colo.

CIRCLE INFORM-A-GRAM KEY NO. 1801

HAND PRECISION MADE
ROTARY FILES
and TOOLS

Carbide Slitting Saws
Carbide Burrs
Solid Carbide End Mills
Carbide Head-Steel Shank
and Solid Carbide Reamers
Carbide Grinding Burrs
Carbide Burr Sets
Solid Carbide and Carbide
Tipped Tools
High Speed Steel Rotary Files
and Burrs

All Essex Tools furnished with shanks ¼" in diameter and 1¼" in length unless otherwise specified.

In addition to the foregoing, Essex maintains a special department for the design and making of solid carbide and carbide-tipped tools, inclusive of counterbores, step-drills, twist drills, dies, grooving cutters, key cutters, T-Slot cutters, router bits, profiling cutters, etc., to sketch or blueprint.

Complete resharpening and reconditioning service available.

Areas available for distributors; inquiries invited.

MAKERS OF FINE TOOLS SINCE 1868

ESSEX ROTARY FILE & TOOL CORP.
295 Madison Avenue, New York 17, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1802

SYNTRON
Vibrating
LAPPING
POLISHING
MACHINES

Before
After
•Automatic, high-speed lapping and polishing of parts, samples, etc.
•Produce perfect scratch-free finishes in one-third the time.
•Eliminate use of expensive polishing wheels—practically no rejects.

New Syntron Lapping-Polishing Machines are completely automatic. Driven by variable controlled electromagnets, they assure a positive, even polishing action on practically any part or sample where microscopic finishes are required. No expensive installation or grinding equipment required.

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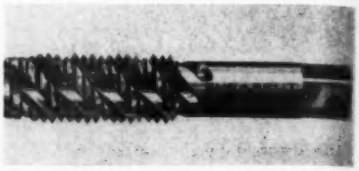
SYNTRON COMPANY
341 LEXINGTON AVENUE HOMER CITY, PENNA.

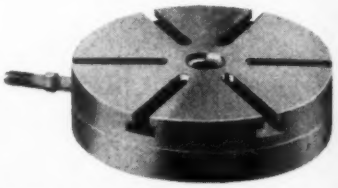
CIRCLE INFORM-A-GRAM KEY NO. 1803

Cut Tapping Costs from 25 to 75% with new Shearcutter premium thread broaches. They're designed to operate at three to six times the speed usually used for conventional taps. They may be resharpened on



any tool and cutter grinder. These broaches feed a solid chip out of the hole being tapped. Shearcut Tool Co., 7045 Darby Ave., Reseda Calif., or —**Circle Inform-A-Gram No. A45.**

Move by Hand Workpieces Weighing Several Tons, by using the new "Jato" airlift table. The table facilitates inspection of large pieces and permits almost effortless burring,



drilling and other operations. It requires only normal shop airline pressure for operation. James C. Hartley Associates, Branford, Conn., or **Circle Inform-A-Gram No. A46.**

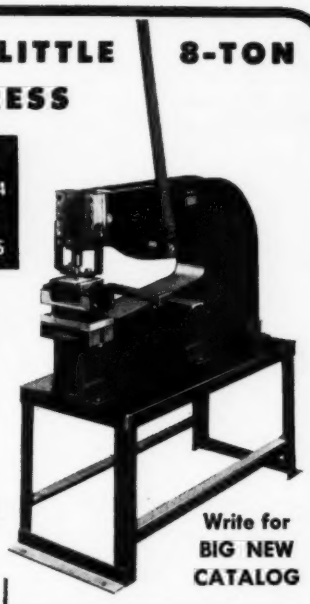
Increase Tool Life and cut rejects with a stain-free coolant for cutting and grinding aluminum. The coolant has anti-weld properties that prevent welding chips and dust to tools and wheels. International Compound 131-A is produced by International Chemical Co., Inc., Dept. A 60, 2628 N. Mascher St., Philadelphia 33, or — **Circle No. A47.**

File and Saw iron, steel, brass, plastic, and aluminum with the "Speed-Nu-Matic" Saw and File. This light-weight, portable tool will use a regular hacksaw blade and has a ¼" hole in the chuck for bench

filing. It is a complete tool, requiring no attachments for sawing or filing. R and G Engineering Co., 1512 W. Slauson Ave., Los Angeles 47, or — **Inform-A-Gram No. A48.**

A GREAT LITTLE 8-TON LEVER PRESS

WHITNEY-JENSEN Nos. 31/32/33/34 DEEP THROAT LEVER PRESSES



Wonderful for Odd Jobs and Short Runs

CAPACITY
½" HOLE THRU 3/16" MILD STEEL
1¾" HOLE IN 12 GA. SHEET

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7"/10"/18"/24" THROAT DEPTHS

We have a Complete Line of Punches and Dies, Accessories and Special Attachments

WHITNEY METAL TOOL COMPANY
712 FORBES ST., ROCKFORD, ILL. Since 1910

CIRCLE INFORM-A-GRAM KEY NO. 1811

NEW!

Em-re PRECISION DIAL INDICATORS
THE MOST ACCURATE MADE

Patents Pending.

Some time ago, we recognized the need for a dial indicator with greater accuracy . . . So, using the finest tools, materials and workmanship that money could buy, we began building the "Em-re."
The result, a fully-jeweled, precision dial indicator that will consistently (after millions of checking operations) give *repeated*, accurate readings — surpassing A.G.D. tolerances. Furthermore, this is the only 100% shockproof mechanism on the market . . . Stocked in 24 models having 6 ranges from .025" to .250" with graduations in .00005", .0001", .00025", .0005" and .001".

See this new line of indicators in Booth 910 ASTE SHOW CHICAGO March 19-25

or
Send today for Bulletin 455- E.

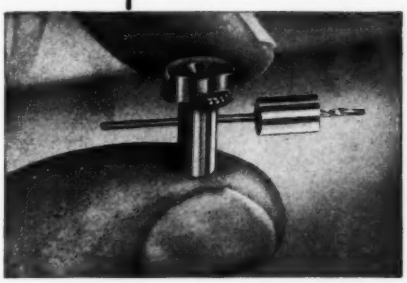
PETZ-EMERY INC.
PLEASANT VALLEY, NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 1813

***ULTRA PRECISION BUSHINGS . . .**

For gauge assemblies, flow orifices, wire drawing dies, etc. Guaranteed accuracy to .0001 in bores up to ⅜" long.

★ With Micro Drill Guides



Special Holes are Standard!

No change in price or delivery for metric and special hole sizes in STANDARD MICRO DRILL GUIDE RANGE OF #80 to 3/32" in listed body sizes.

LONGER LIFE

No counter bore . . . diamond lapped hole with full length drill bearing.

MICRO DRILL GUIDE
JEDCO
SUPERIOR AVENUE CINCINNATI 36 OHIO

Also Available

- Special Micro Drill Guides with body sizes other than those listed and hole sizes not in the standard #80 to 3/32" range.
- Job micro-drilling of your parts.
- Engineered MICRO-TOOLING, drills, jigs, collets, etc.

DISTRIBUTORS REPRESENTATIVES
We Now Have Some Areas Available. Contact Us Immediately.

CIRCLE INFORM-A-GRAM KEY NO. 1812

NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

NEW MODEL 70
MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

Hand Shank

Press shank for foot or power presses

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Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Automatic - Numbering Heads also can be supplied.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1814

SPEED UP PRODUCTION
with these PALMGREN
ANGLE VISES · MACHINE VISES
ROTARY TABLES

See how Palmgren vises, rotary tables, milling attachments and other machine tool accessories can speed up YOUR production and save time and money, too. Used in all industries, EVERYWHERE. 64 different models and types. Send for new catalog No. 203.

$39.95

No. 24B ANGLE VISE
4" jaw

Solve difficult Angle jobs on the production line—quick, accurate setups at any angle in such operations as drilling, milling, grinding. Also other jaw sizes: 1½", 2½", 3", 4", 6" and 8".

No. 60B MACHINE VISE $89.95
6" jaw

A precision vise, with or without swivel base, constructed for heavy-duty service in such jobs as milling, drilling, grinding, shaping and other operations requiring a rugged holding device. Also 40B—4" jaw.

$69.95

No. 83 ROTARY TABLE

Two cross feed slides and Rotary Feed converts your drill press for vertical milling. The No. 83 has an 8" diameter top with T slots ⅝" x 1" x 11/16" for keys or T bolts. Rotary dial is graduated in 3 minute intervals.

CHICAGO TOOL AND ENGINEERING CO.
8388 South Chicago Ave. • Chicago 17, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1821

LOW COST INDUSTRIAL INCINERATOR

BURNS TRASH SAFELY OUTDOORS

New 12 bushel capacity burner provides safe and efficient outdoor refuse disposal at low cost. Scientific draft control ends fire hazards of flying ash, sparks, burning blowing bits of paper. Intense combustion burns damp, green or dry refuse to fine ash in any weather. Minimizes smoke and smell. Needs no watching. Won't blow over. Ends refuse hauling and fire hazards. Safe for use within 10 feet from out buildings. Satisfaction guaranteed. Only $79.50 — F.O.B. Cleveland. Immediate shipment. Send purchase order, today.

SPECIFICATIONS

- *Stands 5' high x 36" square at base — lifts off 10" high ash pan.*
- *12 bushel burning capacity*
- *Made of Armco rust-resistant aluminized steel (molten aluminum bonded to steel).*
- *Complete with ash pan base and grate.*
- *Needs no auxiliary fuel.*
- *Shipped completely assembled—weight 165 lbs.*

ALSTO COMPANY
Dept. TP-1, 4007 Detroit Ave., Cleveland 13, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1822

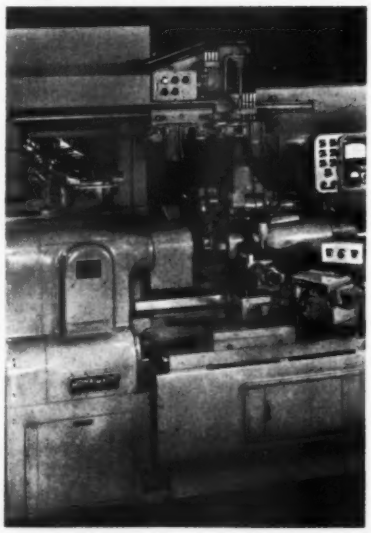
Automatic Loader Positions Work Between Centers

A new hydraulically-actuated automatic loading mechanism developed for feeding work to the Monarch Model 21 Mona-Matic lathe, incorporates a gravity chute and a shuttle conveyor designed to hold a supply of rough workpieces to be machined on the lathe.

The loader automatically positions each of these pieces between the work centers of the machine, triggers the multicycle programer set for a four cut automatic work cycle of the lathe, and finally removes each finished piece from the lathe when the desired cuts are completed. No manual control by the operator is required for any portion of this operating sequence, and the loading mechanism and the lathe function continuously as long as a supply of new workpieces is maintained in the loader's conveyor chute. Once the machine is set in motion for the production run, the operator has only to maintain a quantity of new workpieces in the automatic loader.

The lathe used with the loader mechanism is a standard Mona-Matic lathe, Model 21, built by The Monarch Machine Tool Company, Sidney, Ohio, with an air-operated tailstock unit and an air-operated chuck connected to and actuated by the loader control circuit.

During operation, the rough workpieces resting in the conveyor chute of the loader are engaged one at a time between a pair of traveling centers. These centers transport the individual piece horizontally to a position above the work area of the lathe. The piece is then grasped by one pair of arms of a double-armed, rotating head, whereupon the traveling centers release.



Assuming the lathe has completed the machining of the preceding piece, the rotating head of the loader descends and grasps the finished workpiece with its second pair of arms, and the air chuck and air tailstock of the lathe disengage. The head then removes the finished piece from the chuck, rises vertically, rotates the rough workpiece held in its first set of arms into alignment with the work axis of the lathe, and descends. The rough workpiece is positioned in the chuck, and the air chuck and tailstock engage. The arms of the rotating head release their grasp on the rough workpiece and the head rises. The lathe then begins turning the new rough workpiece.

The finished workpiece held in the second set of arms of the rotating head is clamped between another set of traveling centers when the head reaches the top of its vertical travel. The arms release the finished piece and the traveling centers transport it horizontally to a shuttle conveyor which feeds the finished workpiece to the rear of the machine. The cycle is thus completed and the loader is ready to repeat the entire sequence for each succeeding piece in the production run.

CERROMATRIX DOES IT!

Slide Rods Anchored at ½ Cost of Machining for Drive Fits

HERE'S HOW:

GROOVED slide rods were inserted in cored, oversize holes and aligned in a holding fixture. Cerromatrix was melted and poured in place. When frozen, Cerromatrix expanded to give a tight fit that exceeded the life of the machine. Proven by 20 years in service.

Find out how YOU can save money in anchoring bearings, bushings and non-moving parts in machine building by writing for Bulletin A1.

CERRO DE PASCO CORPORATION

316 Park Avenue, New York 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1831

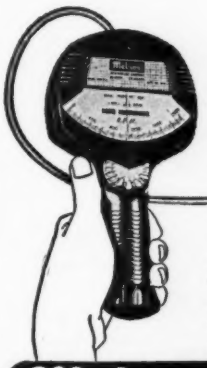
You get

DEPENDABLE *and* READABLE RPM & FPM

speed measurements with the new

Metron 3 in 1 Tachometer

...3 "sliding-scale" ranges in 1 instrument.



- It's more *dependable* because of simpler operating principle.
- It's more *readable* because you can see only one set of scale numbers at a time.
- You switch easily to any of 3 "sliding scale" ranges.
- You cannot damage by overspeeding.
- You get steady readings—electric cable prevents instrument vibration.

Control quality, increase production and protect machines—operate your equipment at the ONE BEST SPEED measured frequently and easily with the Metron 3 in 1.

Request Bulletin 103 for complete details.

Metron INSTRUMENT CO.
443 Lincoln St., Denver, Colorado
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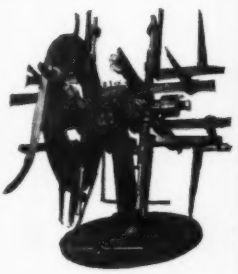
CIRCLE INFORM-A-GRAM KEY NO. 1833

LESS DOWN TIME, MORE PRODUCTION FROM PUNCH PRESSES FED BY



LITTELL DOUBLE AUTOMATIC CENTERING REELS

Vital minutes are saved, with practically no down time for coil replacement, when a Littell Double Reel uncoils stock to the punch press. The idle side of the reel is loaded while the other side pays out. When a coil is used up, the operator simply lifts the hub lock pin, then swivels the reel 180°, thus placing the reserve coil in press feeding position. The changeover is complete in a few seconds. Like Littell Single Reels, Littell Double Reels combine balance that means smooth running accuracy with rugged malleable iron and steel construction that assures year in, year out dependability.

FOUR SIZES
No. 3 . . . . . for coils up to 300 lbs.
No. 5* . . . . for coils up to 600 lbs.
No. 10* . . . for coils up to 1,000 lbs.
No. 25* . . . for coils up to 2,500 lbs.
*Can be furnished with motor drive

Write for catalog

F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • DIAL FEEDS
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

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CIRCLE INFORM-A-GRAM KEY NO. 1832

Gage Company PRECISION PLASTIC COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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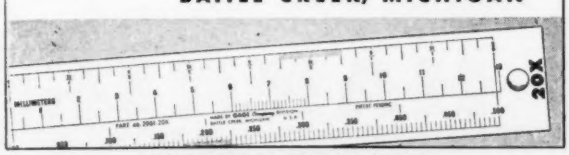
GAGE COMPANY
BATTLE CREEK, MICHIGAN



CIRCLE INFORM-A-GRAM KEY NO. 1834

ARE YOU HAVING CUT-OFF PROBLEMS?

SOLVE THEM WITH AUTOMATIC CUT-OFF MACHINES

AT UP TO 60% SAVINGS

Roll Formers:

★ Our machines will cut off any material and any form automatically, accurately, and at high speeds.

★ Multiple operations, in addition to cut-off can be performed on special order.

Other Users:

★ Special Machines built to cut off or do work on any moving or static material.

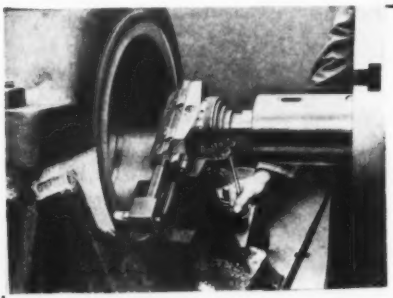
Write Us Your Requirements

PRODUCT DESIGN ENGINEERS

65 South Broadway Yonkers, N. Y.

Tel. YOnkers 9-1476

CIRCLE INFORM-A-GRAM KEY NO. 1841



Wohlhaupter MASTERHEAD

Nine Models for Smallest to Largest Work Ranges

Face - Bore - Turn - Recess - Undercut, etc. All Automatically up to 36 1/4" on one machine. For Precision Work and Most Economical and Automatic Operation.

- Twelve Automatic Slide Feeds
- Automatic End Release
- Sturdy, Compact Construction
- Increase Production; Make Better Finished Work

UPA6-S7 OUR LARGEST MODEL

Particularly well suited for the largest Jig Mills, Radial Drills and other Heavy Machines

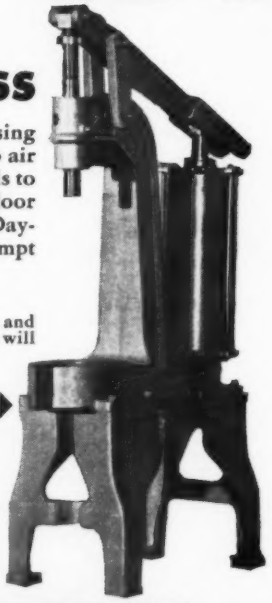
Karl A. Neise 404 Fourth Ave. N. Y. 16, N. Y., Dept. TP.

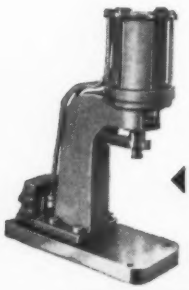
CIRCLE INFORM-A-GRAM KEY NO. 1842

SAVE!

WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.





WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $554.

1-ton Hand-D-Press. For small parts manufacturers. Press, $232.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

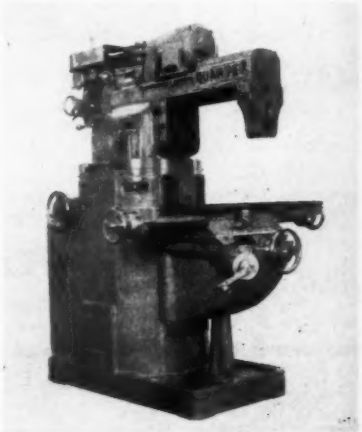
HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1843

MILLING MACHINE HAS HORIZONTAL SPINDLE INDEXING

The horizontal spindle, rather than the saddle and table, indexes for universal operations on the "Quartet". This milling machine was built by U. S. Burke Machine Tool Div'n, Cincinnati, O.

The spindle is mounted in a massive turret which may be swiveled 360°. When the "Quartet" is used as a universal horizontal miller, the spindle is indexed to the required angle instead of swiveling the saddle, thus providing extreme rigidity for precision work.



The machine will also perform vertical and angular milling operations. It has 30" horizontal travel, 11" cross travel, and 16¼" vertical travel.

The "Quartet" may be used to mill, drill, bore, tap, face, and counterbore a workpiece in one setting. The operations are performed without the use of fixtures and to extremely close tolerances.

The features of the new machine include infinitely variable horizontal spindle speeds from 29 to 1450 rpm. The horizontal and vertical spindles may be used simultaneously and the machine can be operated while the turret is being indexed.

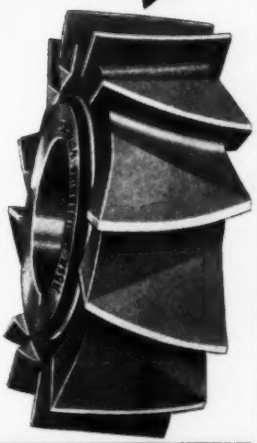
Simonds Saw and Steel Co., Fitchburg, Mass., is now furnishing a complete line of "Red Tang" files. The line includes American pattern files and rasps, "American-Swiss" Swiss pattern files, "Vixen" milled curved-tooth files and holders, and rotary files and burrs.

ABER

Curved Tooth MILLING CUTTERS ARE Better...

here's 5 reasons Why

1. Give More Accurate Control of Limits and Finish
2. Elimination of Chatter and Breakage
3. Extended Cutter Life
4. Better Performance
5. Increased Production



Patented Curved Tooth Design of all *Aber Cutters* permits faster, easier operation, because the curve of the tooth face is built up and strengthened at the corner of the tooth which first enters the cut. This makes possible a *SHEARING ACTION* and eliminates the shock of contact with the work. Dissipation of heat is faster, eliminating friction. . . . Write today for complete information.

FREE DATA on "How to Sharpen Curved Tooth Milling Cutters".

ABER ENGINEERING WORKS
WATERFORD, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1851

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

***A BORING HEAD THAT WON'T FACE IS NOT COMPLETE**

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO.
Muncie, Indiana

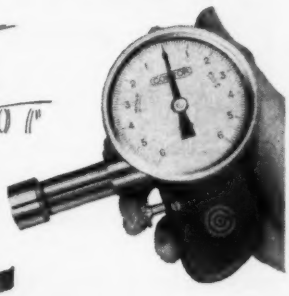
COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

CIRCLE INFORM-A-GRAM KEY NO. 1852

Did you know that---

The odds are 2 to 1 that the transmission in your new car was gaged by Comtorplug



Precision Internal Gage
SIZES FROM 1/8" to 8" AND LARGER

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

UNIQUE ADVANTAGES

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging — automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance, and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it — investigate and see why.

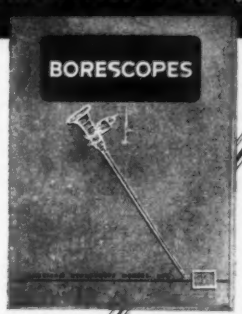
COMTOR CO.
82 Farwell St.
Waltham 54,
Massachusetts

GET THE FULL FACTS — REQUEST BULLETIN 48

CIRCLE INFORM-A-GRAM KEY NO. 1853

INSPECTION PROBLEMS?

This booklet is for you!



This comprehensive, elaborately illustrated booklet provides practical information on the use of the famous A. C. M. I. Borescope in various industries, for the inspection of interior areas or surfaces not otherwise visible—together with full data on the types of Borescope available, and on their care and maintenance. Have you received your copy?

Free on request — *Fill in and mail today*

To *American Cystoscope Makers, Inc.*
1241 LAFAYETTE AVENUE NEW YORK 59, N. Y.

Gentlemen: Please send me without obligation a copy of your booklet on Borescopes.

Name_____
Firm_____
Address_____
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1854

CAMS

To Your Specifications

• • • • •

— Except Screw Machine Cams —

• • • • •

Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1861

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1862

REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

BALL HANDLES—Threaded

ROUND AND OVAL PLASTIC HANDLES CAN BE SUPPLIED IN A CHOICE OF BLACK OR RED PLASTIC

ROUND PLASTIC | 0A OVAL PLASTIC | 0B OVAL PLASTIC | MUSHROOM PLASTIC | ROUND STEEL

These are designed for machine tools, jigs, fixtures, shift lever handles, etc. and give your product that "dressed up" appearance. Made in a wide variety of diameters and thread sizes. Steel ball handles are turned from bar stock. Highly polished. Low prices and the finest quality.

ALSO clamping handles, C.I. hand knobs, malleable machine handles, compression springs, hand wheels, spherical washers and many other accessories and components at low prices.

FREE!
NEW 60 pg. CATALOG

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1863

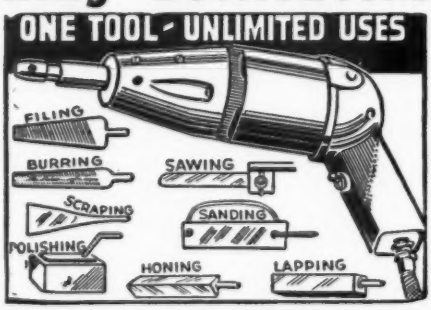
B-R-E-A-K . . .
Hand Finishing Bottlenecks

WITH

PORTABLE • ELECTRIC
RECIPROCATING TOOLS

These handy tools will cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Delivers 1/8" or 3/16" fixed stroke at 1000 strokes per minute — Operates on 110 volts AC or DC.



ACME TOOL COMPANY
73 WEST BROADWAY NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1864

PMI Welcomes the Netherlands Stamping Team

During the recent Cleveland visit of the Small Business Team from the Netherlands, the Pressed Metal Institute had the honor of welcoming stamping industry members of the team and exchanging views on metal stamping practices and conditions existing in Holland and America.

Representatives of the Netherlands team were W. L. van Lakerveld, director of the Department for Industrial Investments of the Ministry of Economic Affairs, The Hague, and Jb. Pielkenrood, president, Metalindustry Pielkenrood N. V., Zaandijk. PMI representatives were Joseph J. Boehm, president, W. B. Gemmill, secretary-treasurer, and Harold A. Daschner, managing director of PMI.

A statement of purpose of the team's tour was made which formed the basis for discussion.

Manufacturing industry — employing about 1.7 million people or 40% of all workers — is of very great importance to the economy of the Netherlands. In the drive for higher productivity — started since World War II with American help—special attention is paid to small and medium sized industry, which employ 80% of all workers in industry.

Therefore a team consisting of business leaders and experts is visiting the United States to gather information on the following subjects:

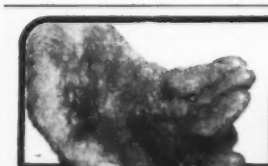
1. The activities of private and governmental agencies concerning productivity in small scale industry.
2. The cooperation of small industries in order to raise productivity.
3. The results actually attained in small industry by cooperation and information.

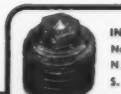
The team members were intently interested in the function of American trade associations, such as the Pressed Metal Institute, because organizations of similar character do not exist in Holland. It was a revelation to them that a group of men engaged in the same industry would join together into an association and exchange ideas on the conduct of their business, but at the same time be competitors. They expressed it,

. . . *Continued on page 188*

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS





IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

HEIMANN MFG. CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1865

AIR-MITE

HIGH PRODUCTION AIR PRESS

with more Quality Features

★ Solid Steel Column. Greater strength and rigidity.
★ Brass cylinder, aluminum end castings, Hy-Car piston cups.
★ Accurately ground table.
★ Fast set-up and stroke adjustment.

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity
$89.95
F.O.B. Chicago

New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

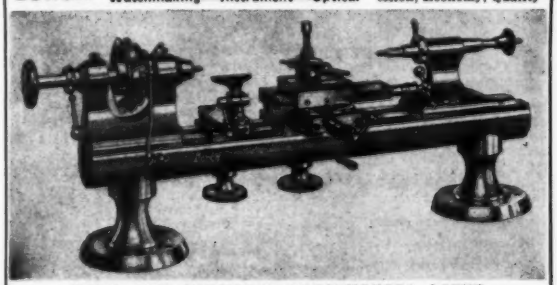
AIR-MITE Devices, Inc.

4417 W. CARROLL AVENUE, CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1871

LORCH Small Precision Lathes Watchmaking—Instrument—Optical

World famous for Precision, Economy, Quality

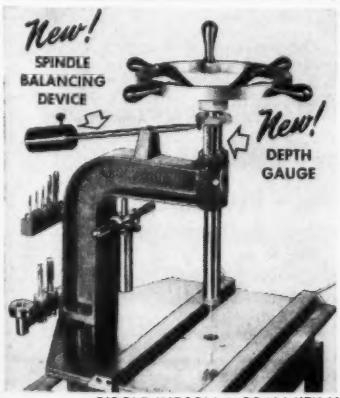


MODEL WW PRECISION WATCHMAKERS LATHE

An elaborate assortment of lathes for many purposes. For single parts as well as production. Available with large assortment of accessories such as turrets, thread cutting equipment, multiple tool slides, milling attachments, etc. Tolerance chart will be supplied with literature.

KARL A. NEISE Dept. TP, 404 Fourth Ave., New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1872



LASSY

TAPPERS

Set new standards for cut thread accuracy. Are universally used in the Tool Room and for small lot production. No set up. Always ready for instant use.

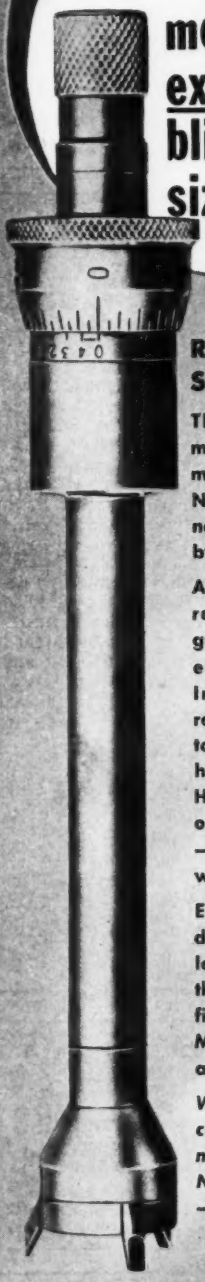
Write for illustrated circular showing all models.

LASSY TOOL CO.
Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1873

Etalon INGAGE

measures the exact bore or blind hole size



Reading: .0001"
Sizes: 3/16" to 1.6"

This unique new precision measuring instrument will take measurements of blind holes. No masters or setting rings needed — measures *directly* — by .0001".

Automatically aligns in holes, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes. Extensions facilitate accurate measurements of holes up to 6 feet in depth. Hardened contact points exert only 11 oz. measuring pressure —will not damage even fragile work.

Exceptionally easy to read, deep clean-cut graduations laid out on a large diameter thimble. Dull chrome plated finish. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS—MICROMETERS —DIAL INDICATORS

ALINA

ALINA CORPORATION
401 Broadway, New York 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1874

. . . PMI Welcomes from Page 186
as their opinion, that the free exchange of ideas and information was one of the reasons for the prosperity of American business. The freedom enjoyed by Americans is lacking in the Netherlands and poses as one of their handicaps.

In Holland there are three workers unions, one political and two religious. Workers belong to one of them. Likewise there are three unions, one political and two religious, to which industry belongs.

Under this system each union encompasses all crafts. For example, each union has metal workers as members. The same is true of the industry unions, each one having metal working plants as members.

When wage rates are being negotiated, all three worker unions and all three industry unions participate. Whatever settlement is made is effective nation wide.

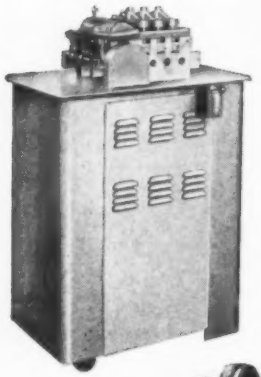
Howard P. Chace has retired as chief sales engineer of the Grinding Machine Div'n of Norton Co. He joined the company in 1911. His successor will be F. Kenwood Jones.

Industry and government will spend between $4.5-billion and $10-billion on nuclear reactor plants and related research and development in the decade between 1955 and 1965, according to an Atomic Industrial Forum survey. The Forum estimates that the manufacture of components for reactor plants may be over a $700-million-a-year business by 1963. The Forum plans to update the growth survey from time to time so that industry might have a better estimate of what lies ahead, noted Charles Robbins, executive manager of the Forum at the Nuclear Congress in Cleveland last month.

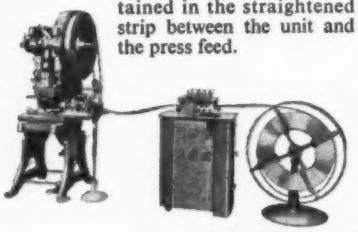
Economy · Dependability

WITTEK

STOCK STRAIGHTENERS



Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

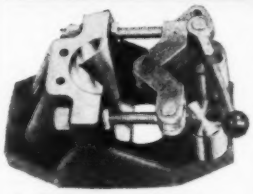
4323 W. 24th Place • Chicago 23, Illinois

Production Feeding Equipment

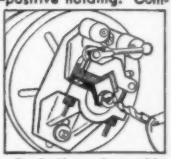
5577

CIRCLE INFORM-A-GRAM KEY NO. 1881

LASSY **WORK HOLDERS**



Quick, accurate setups on lathes, jig borers, milling machines, grinders and drill presses. Normalized and accurate to .0005 in 3 inches. Hold round or odd shapes. Quick acting cam-lock swing clamp for fast loading—positive holding. Complete line of standard accessories includes jaws and clamps for multiple holding and also for use as drill jig. Made in 4 models—capacity to 4 inches. Write for complete descriptive literature.



Production setups with repetitive accuracy

LASSY TOOL CO., Plainville, Conn.
Makers of Lassy Tappers

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STANDARD FLUSH PIN GAGES

Precision Built
of Precision Ground
Oil Hardened
Tool Steel

Can be Furnished with Indicator Mountings
Completely Ground to Your Specifications and Ready for Use
No Design Necessary
Deliverable from Stock

Write for Latest Catalogue as well as our Automatic Free Service.

UNION GAGE CORP.

711 Lehigh Avenue Tel. Murdock 6-9150 UNION, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1884

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

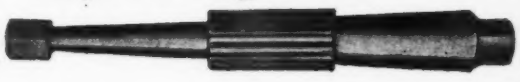
US

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

IMMEDIATE DELIVERY on all wheel sizes, STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1882

Expanding Mandrels



Accuracy 001" - No Distortion

No Slipping - Everlasting

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1885

THE INFORM-A-GRAM
CARD PAGE 150.1 IS
FOR YOUR CONVENIENCE IN
MAKING INQUIRIES

Tomco

HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO.

1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

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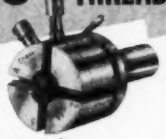
CUTTING THREADS?



CHASO'S chasers and self opening dieheads offer the fast economical way to do Production threading.

CHASO also manufactures chasers for most makes of dieheads thus offering a complete thread chaser service for whatever dieheads you have.

CHASO chasers are *guaranteed* to perform satisfactorily, and at a savings in your threading costs.

Write for complete catalog

When you think of chasers think of CHASO.

MANUFACTURING CHASERS FOR 25 YEARS

CHASO TOOL CO. INC.
PHONE 2210
BOX 268A NORTH BRANCH, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1892

JIG BORING
and
Large Precision Machining
Done to your specifications

We Have
14 Jig Borers

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

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You Can Rely on a **ROUSSELLE**

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Manufacturers of Rousselle Presses

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

Choice of 25 models in 5 to 40-ton sizes.

SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1894

TOGGLE CLAMPS

- Free Action
- Shoulder Rivets
- Black Oxide Finish
- Savings of 50%

STANDARD PRECISION DOWEL PINS

- Ground to a tolerance of ±.0001".
- Surface hardness 60-62 Rockwell "C" Scale.
- Surface finish: 6 rms. max.

AT A SUBSTANTIAL SAVINGS

Catalog Number	Net Prices Each 1-49*	50-99*	100 or more*	Recommend Working Capacity	Maximum Holding Capacity
	*Assorted				
TC-1	1.30	1.25	1.15	250#	450#
TC-2	1.40	1.30	1.25	400#	650#

DIEMAKERS PRODUCTS, INC., 2177 W. 28th St., Cleveland, O.

CIRCLE INFORM-A-GRAM KEY NO. 1895

HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

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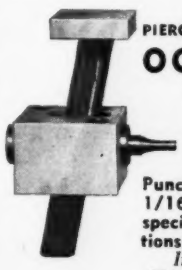

FOR SIDE HOLE PIERCING OR FORMING USE

OCTOCAMS
(pat. pend.)

OCTOCAM pays for itself through savings in toolmaking time.

Punches available from 1/16" to 1/2". We build specials to your specifications.

Immediate Delivery
Write for Descriptive Bulletin

OCTAVIA TOOL & GAGE CO.
3320 N. Kedzie Ave. -:- Chicago 18, Ill.

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ADVERTISERS INDEX

A. A. Gage Co. 45
Aber Engrg. Works, Inc. 185
Abrasive Machine Tool Co. 56
Ace Drill Bushing Co., Inc. 175
Acme Mfg. Co. 59
Acme Tool Co. 186
Advance Products 149
Aget Mfg. Co. 175
Air-Mite Devices, Inc. 187
Alina Corp. 187
Allegheny Ludlum Steel Corp. 151
Allen, Alva F. 173
Allen Mfg. Co. 31
Allied Products Corp.
Richard Brothers Punch Div. 50
Alsto Co. 182
American Cystoscope Makers, Inc. 185
American Drill Bushings Co. 5
American Society of Tool Engineers 15
Armstrong-Blum Mfg. Co. 128
Armstrong Bros. Tool Co. 144
Atlas Press Co., Clausing Div. 6
Atrax Co. 9
Avildsen Tools & Machines, Inc. 172

Balas Collet Mfg. Co. 191
Barnes Co., Inc., W. O. 16
Barth Corp., The 102
Bausch & Lomb Optical Co. 12, 146
Bellows Co., The 17
Benchmaster Mfg. Co. 90
Besly-Welles Corp. 94
Black Drill Co., Inc. 166
Blake Co., Inc., Edward 136
Blanchard Machine Co., The 13
Bliss Co., E. W., Die Supply Div. 91
Bodine Corp., The 51
Bokum Tool Co. 148
Buck Tool Co. 154
Buckeye Tools Corp. 10
Buhr Machine Tool Co. 88
Burg Tool Mfg. Co. 178

Carpenter Steel Co., The 27
Cerro de Pasco Corp. 183
Challenge Machinery Co., The 170
Chandler Tool Co. 185
Chaso-Royco Tool Co., Inc. 189
Chicago-Latrobe 122
Chicago Tool & Engrg. Co. 182
Cincinnati Milling Machine Co., The 3
Clausing Div. Atlas Press Co. 6
Clearing Machine Corp.
Div. of U. S. Industries, Inc. 57
Cleveland Grinding Machine Co., The 173
Comet Tool Co. 177
Commander Mfg. Co. 160
Comtor Co. 185
Cooper Weymouth, Inc. 176
Crucible Steel Co. of America 119

Danly Machine Specialties, Inc. 115
Dayton Rogers Mfg. Co. 149
Dearborn Gage Co. 98
Detroit Die Set Corp. 46
Detroit Power Screwdriver 120
DeVlieg Microbore Co. 53
Diamond Machine Tool Co. 111
Dickerman Mfg. Co., H. E. 133
Die Supply Div. of E. W. Bliss Co. 91
Diemakers' Products, Inc. 189
Dremel Mfg. Co. 177
Dumore Precision Tools,
The Dumore Co. 30
Durable Punch & Die Co. 143
Durant Tool Supply Co. 165
Dykem Co., The 176

Eisler Engineering Co., Inc. 172
Elox Corp. of Michigan 121
Erickson Tool Co. 60
Essex Rotary File & Tool Corp. 180
Ex-Cell-O Corp. 137

Fellows Gear Shaper Co., The 22

Gage Co. 183
Gardner-Denver Co.,
Keller Tool Div. 32
Gorton Machine Co., George 11
Grawell Carbide Tool Co. 179
Greenlee Brothers & Co. 140
Greist Mfg. Co., The 152

Hamilton Tool Co., The 125, 127, 129
Hammond Machinery Builders, Inc. 145
Hannifin Corp. 184
Harco Engrg. Co. 167
Hardinge Brothers, Inc. 26
Harig Mfg. Corp. 63
Hause Engineering 175
Heimann Mfg. Co. 186
Hi-Shear Rivet Tool Co., The 171
Hovis Screwlock Co. 130
Huebner Publications, Inc. 14, 52, 146, 160
Humm Safety Equipment Co. 174
Hutchinson Co., William T. 165

Injection Molders Supply Co. 169

Jaco Devices, Inc. 175
Johansson Gage Co., C. E. 123
Johnson Mfg. Corp. 147
Jones & Lamson Machine Co. 33, 124
Junior Achievement 117

Kasson Die & Motor Corp. 174, 177
Kearney & Trecker Corp.
Special Machinery Div. 24
Keller Tool Div.,
Gardner-Denver Co. 32
Kidde Precision Tool Corp. 186, 189

LaSalle Tool, Inc. 47
Lassy Tool Co. 187, 188
Lavallee & Ide, Inc. 4
Lee Co., K. O. 188
Lepel High Frequency Labs., Inc. 55
Lincoln Gage Co. 132
Littell Machine Co., F. J. 183
Lord Chemical Corp. 99
Lucas Machine Div.
New Britain Machine Co., The 40

May-Fran Engineering, Inc. 107
Mayline Co. 179
Mead Specialties Co. 19
Melin Tool Co., Inc. 157
Metal Carbides Corp. 170
Metron Instrument Co. 183
Mettler Machine Tool, Inc. 114
Meyers Co., Inc., W. F. 177
Micro Drill Guide 181
Midwest Gage Laboratory
Div. of Size Control Co. 160
Mighty Mover Co. 180
Miller Fluid Power Co. 100
Modern Engineering & Service Co. 92
Mohawk Tools, Inc. 139
Moline Tool Co. 142
Moore Special Tool Co., Inc. 29
Morrison Engrg. Co. 149

National Acme Co., The 35
Nebel Machine Tool Corp.
Smith & Mills Shaper Div. 96
Neise, Karl A. 184, 187
New Britain Machine Co., The 40
Newcomer Products, Inc. 172
Niagara Machine & Tool Works 36
Nicholson File Co. 39
Nobur Mfg. Co. 160
Norgren Co., C. A. 112
Northwestern 167
Numberall Stamp & Tool Co. 181

Octavia Tool & Gage Co. 189
O'Neil-Irwin Mfg. Co. 62

Parker Stamp Works, Inc. 28
Perfex Gage & Tool Co. 173
Petz-Emery, Inc. 181
Pivot Punch & Die Corp. 161
Pope Machinery Corp. 156
Portage Double-Quick Tool Co. 141
Porter Precision Products 131
Potter & Johnston Co. 87
Pratt & Whitney Co., Inc. 103, 106
Product Design Engineers 184
Producto Machine Co. 165
Punch Products Corp. 95
Putnam Tool Co. 1

Reid Tool Supply Co. 186
Reliant Industries 104
Rice Pump & Machine Co. 167
Richard Brothers Punch Div.
Allied Products Corp. 50
Richards Co., J. A. 165
Ring Punch & Die Co. 153
Roll Feeds Corp. 171
Ross Operating Valve Co. 34
Rotor Tool Co. 49
Royal Oak Tool & Machine Co. 134

Scherr Co., Inc., George 149, 176, 179
Schmidt, Inc., Geo. T. 149
Scott-Browne Corp.
Micro-Chuck Div. 176
Service Machine Co. 189
Sesco, Inc. 135
Set Screw & Mfg. Co. 113
Shell Chemical Corp. 20
Shore Instrument & Mfg. Co., Inc. 189
Size Control Co.
Midwest Gage Laboratories Div. 160
Small Lot Stamping Co. 165
South Bend Lathe Works 174
Spellman Co., R. L. 179
Spiral Step Tool Co. 169
Standard Electrical Tool Co. 155
Standard Parts Co. 150
Standard Pressed Steel Co. 8
Stebar Co. 167
Superior Steel Products Corp. 109
Syntron Co. 180

Tannewitz Works, The 169
Thompson & Son Co., The Henry G. 54
Tietzmann Tool Corp. 165, 171
Tomco Products Co. 189
Toolset, Inc. 167
Torrington Co., The 126

Union Gage Corp. 188
United States Diamond Wheel Co. 188
U. S. Industries, Inc.
Clearing Machine Corp., Div. 57
Universal Engineering Co. 43

Valvair Corp. 38
Verson Allsteel Press Co. 192
Vlier Engineering, Inc. 44
Vulcan Tool Co. 164

Wales-Strippit Corp. 58
Walker-Turner Div.,
Kearney & Trecker Corp. 42
Walls Sales Corp. 174
Walton Co., The 179
Ward Machinery Co. 171
Wardwell Mfg. Co., The 176
Watts Brothers Tool Works 186
Weldon Tool Co. 168
Wells Mfg. Corp. 166
West Point Mfg. Co. 18
Wheel Trueing Tool Co. 2
Whistler & Sons, Inc., S. B. 138
Whitney Metal Tool Co. 181
Willey's Carbide Tool Co. 146
Wittek Mfg. Co. 188

Yost Mfg. Co. 172

Zagar Tool, Inc. 105

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